

U. S. Circuit Court. Northern District of  
Illinois. Northern Division.

National Phonograph Co.)

versus ) In Equity

Lambert Company ) No. 26,598

RECORD 1902 -- 1904

U. S. Circuit Court of Appeals for the Seventh  
Circuit, October Term 1904

No. 1154



TRANSCRIPT OF RECORD

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IN THE  
UNITED STATES CIRCUIT COURT OF APPEALS  
FOR THE SEVENTH CIRCUIT.

OCTOBER TERM, A. D. 1904.

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No. 1154.

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NATIONAL PHONOGRAPH COMPANY,  
*Appellant,*

*vs.*

LAMBERT COMPANY,  
*Appellee.*

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MR. PHILIP C. DYRENFORTH,  
*Counsel for Appellant.*

MR. THOMAS F. SHERIDAN,  
*Counsel for Appellee.*

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Appeal from the Circuit Court of the United States for the Northern District  
of Illinois.

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TRANSCRIPT OF RECORD FILED FEB. 1, 1905.  
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Filed  
Mar 11 1905  
Edward M. Holloway,  
Clerk

(NOTE: ORIGINAL VOLUME SPLIT INTO  
TESTIMONY & EXHIBITS FOR MY CONVENIENCE)  
Vol. I - Testimony

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Pleas in the Circuit Court of the United States for the Northern District of Illinois—Northern Division in Chancery sitting at the United States Court room, in the City of Chicago, in said District and Division before the Honorable Christian C. Kholmaat, District Judge of the United States for the Northern District of Illinois, on Wednesday, the Seventeenth day of August, being one of the days of the regular July Term of said Court, in the year of our Lord one thousand nine hundred and four and of our independence the one hundred and twenty-ninth year.

MARSHALL E. SAMPSELL,  
*Clerk.*





1

**Bill of Complaint.**

TO THE HONORABLE THE JUDGES OF THE UNITED STATES  
CIRCUIT COURT FOR THE NORTHERN DISTRICT OF  
ILLINOIS, NORTHERN DIVISION.

The National Phonograph Company, a corporation  
organized and existing under and by virtue of the laws  
of the State of New Jersey and having its principal  
place of business at Orange, in the County of Essex,  
and State of New Jersey, brings this, its bill of  
complaint, against Lambert Company, a corporation  
organized and existing under the laws of the State of  
Illinois and having a regular and established place of  
business in the City of Chicago and State of Illinois,  
in said District.

2

And thereupon your orator complains and says:

3

I. That heretofore and before the 11th day of  
November, 1902, Thomas A. Edison, being then as now  
a resident of Llewellyn Park, in the County of Essex,  
and State of New Jersey and a citizen of said State,  
was the original, first and sole inventor of a certain  
new and useful improved process of duplicating phono-  
grams, not known or used by others in this country  
before his invention or discovery thereof, and not  
patented or described in any printed publication in  
this or any foreign country before his invention or dis-  
covery thereof, or more than two years prior to his  
application for a patent therefor in this country as  
hereinafter set forth, and not in public use or on sale  
in this country for more than two years prior to his  
said application, and which had not been abandoned,  
and which invention or improvement was not first  
patented or caused to be patented by the said inventor  
or his legal representatives or assigns in a foreign  
country upon an application filed more than seven

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months prior to the filing of the said application in this country.

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II. That the said Edison, being as aforesaid the first inventor and discoverer of the said improvement, made application in writing to the Commissioner of Patents of the United States for the grant of Letters Patent therefor, and paid into the Treasury of the United States the fees required by law, and then and there fully and in all respects complied with all the necessary conditions and requirements of the statutes of the United States in such case made and provided, and thereupon, after due examination having been made by the Commissioner of Patents as to the novelty and utility of the said invention as provided by law, and after certain further proceedings had, hereinafter referred to, the Commissioner of Patents caused to be issued to the said Edison, Letters Patent in due form of law, under the seal of the Patent Office of the United States, signed by the Commissioner of Patents, and bearing date the 11th day of November, 1902, and numbered 713,209; and that the said Letters Patent did grant unto the said Edison and unto his heirs and assigns, for the term of seventeen years from the date thereof, the exclusive right to make, use and vend the said invention throughout the United States and the Territories thereof, as by said Letters Patent or a duly authenticated copy thereof in court to be produced will more fully and at large appear.

8

III. That prior to the grant to the said Edison of the Letters Patent No. 713,209 aforesaid, to wit: on the 16th day of May, 1900, interference proceedings were instituted by the Commissioner of Patents between the application for the said patent and Letters Patent of Thomas B. Lambert No. 645,920, dated March 20th, 1900, for the purpose of determining the question of priority of invention of the subject matter covered by claim 17 of said patent No. 713,209 and claim 1 of said patent No. 645,920.

laint.

the said application in

ing as aforesaid the first  
said improvement, made  
ommissioner of Patents  
grant of Letters Patent  
Treasury of the United  
law, and then and there  
ed with all the necessary  
of the statutes of the  
ma and provided, and  
on having been made by  
as to the novelty and  
as provided by law, and  
ings had, hereinafter re-  
of Patents caused to be  
tte Patent in due form  
he Patent Office of the  
Commissioner of Patents,  
of November, 1902, and  
the said Letters Patent  
a and unto his heirs and  
tee years from the date  
make, use and vend the  
e United States and the  
Letters Patent or a duly  
in court to be produced  
appear.

st to the said Edison of  
aforesaid, to wit: on  
1900, interference pro-  
y the Commissioner of  
tion for the said patent  
omas B. Lambert No.  
1900, for the purpose of  
priority of invention of  
y claim 17 of said patent  
said patent No. 645,920.

Thereupon, after various interlocutory questions raised on behalf of Lambert had been decided in Edison's favor, extensive proofs were taken for both parties and a hearing on the merits was had before the Examiner of Interferences who, on May 28th, 1901, after a full consideration of the questions involved rendered a decision adjudging said Edison to be the first inventor of the subject matter of the interference. A copy of this decision is hereto annexed and marked "Schedule A." Thereafter appeals from said decision were successively taken on behalf of Lambert to the Board of Examiners in Chief and the Commissioner of Patents, both of which tribunals rendered decisions affirming the Examiner of Interferences. Copies of the decision of the Examiners in Chief, dated August 13th, 1901, and of the Commissioner of Patents, dated December 10th, 1901, are hereto annexed and marked respectively "Schedules B and C."

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IV. Your orator shows on information and belief that prior to the termination of the interference above mentioned this defendant was the owner of or licensee under the letters patent to Lambert involved in the said interference proceeding, and that such proceedings were conducted under the direction of, and upon instructions of this defendant, who was the real party in interest in that controversy.

V. That by virtue of an assignment in writing, duly executed and delivered, your orator became vested with the full and entire right, title and interest in and to the said Letters Patent numbered 713,209, and in and to the invention described and claimed therein, together with any and all right or rights of action, claims and demands whatsoever of the said Edison, either at law or in equity, for damages or profits or both, arising from past infringement of said Letters Patent, with the full right to your orator in its own name to sue upon and collect the

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sa ne, for its own use and behoof, and that your orator has ever since been, and is now, possessed of the same.

14

VI. That your orator is engaged in the manufacture of phonograms produced by the employment of said improvement or invention, and has so manufactured large quantities of such phonograms preparatory to placing the same upon the market, and has invested and expended large sums of money and has been to great trouble in and about the said invention for the purpose of introducing the same and making the same profitable to your orator and to the public; and your orator believes that it will realize and receive large gains and profits therefrom if infringement by the said defendant and its confederates be prevented.

15

VII. That the said defendant, notwithstanding the decision of the Commissioner of Patents rendered in the interference proceedings hereinabove referred to, and well knowing the premises and the rights secured to your orator as aforesaid, but contriving to injure it and to deprive it of the benefits and advantages which might and otherwise would accrue unto it from the said invention, did, after the grant of said letters patent and before the commencement of this suit, as your orator is informed and believes, within the Northern District of Illinois, Northern Division, aforesaid and elsewhere in the United States, without license or allowance and against the will of your orator and said Edison and in violation of its and his rights, unlawfully and wrongfully make, or cause to be made, and is now making, or causing to be made, phonograms by the employment of the said improved process of duplicating phonograms employing and containing the invention set forth in the Letters Patent No. 713,209 aforesaid, and did use or cause to be used, as aforesaid, the said invention in the manufacture of said phonograms; and that it still continues so to do, and that it threatens to continue the aforesaid unlawful acts to a large extent, all

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17

in defiance of the rights secured to your orator as aforesaid, and to its great and irreparable loss and injury, and by which your orator has been and still is being deprived of great gains and profits which it might and otherwise would have obtained, but which have been received and enjoyed by the said defendant through its said unlawful acts and doings. And your orator further shows that as to how many phonograms the defendant has as aforesaid unlawfully made, and as to the extent of the gains and profits received and enjoyed by it from such unlawful making, your orator is ignorant and prays a discovery thereof.

18

VIII. Your orator further shows upon information and belief that the manufacture of the phonograms by the defendant hereinbefore complained of is conducted by it under and in accordance with the invention set forth in the Letters Patent No. 645,920 issued to Lambert above mentioned, of which invention your orator's assignor, the said Edison, has been adjudged by the Commissioner of Patents to be the first inventor and discoverer.

19

IX. That the manufacture of phonograms by the employment of the invention set forth in your orator's Letters Patent No. 713,209 aforesaid by the defendant, and its preparation for and avowed determination to continue the same in disregard and defiance of the rights of your orator, have the effect to encourage and induce others to venture to infringe said letters patent.

20

X. Your orator therefore prays that the said defendant Lambert Company, and its officers, servants, agents, attorneys, employees, workmen and confederates, and each and every of them, may be perpetually restrained and enjoined, by the order and injunction of this Honorable Court, from directly or indirectly making phonograms by the employment of the invention of the Letters Patent No. 713,209, aforesaid, and that they, and each and every of them, be ordered to deliver to

21

your orator or to an officer of this Court for destruction all molds and other apparatus used by the said defendant in the carrying on of said process covered by the said Letters Patent No. 713,209, and that the said defendant may be decreed to pay the costs of this suit, and that your orator may have such other and further relief as to this Honorable Court shall seem meet and as shall be agreeable to equity.

22

XI. Your orator further prays that an injunction *pendente lite* be granted, issuing out of and under the seal of this Honorable Court, enjoining and restraining the said defendant and its officers, servants, agents, attorneys, employees, workmen and confederates, and each and every of them, to the same purport, tenor and effect as hereinbefore prayed for with regard to said perpetual injunction.

23

XII. And forasmuch as your orator can have no adequate relief save in this Court, to the end therefore that the said defendant may, if it can, show why your orator should not have the relief hereby prayed, and may, but not upon oath, an answer under oath being hereby expressly waived, according to its best and utmost knowledge, remembrance, information and belief, full, true, direct and perfect answer make to the premises and to all the several matters hereinbefore stated and charged, as fully and particularly as if the same were here repeated, and it especially interrogated as to each and every of said matters, and may be compelled to account for and pay to your orator the profits by it acquired and the damages suffered by your orator from the aforesaid unlawful acts, and that the Court may assess said profits and damages, and may increase the damages to a sum not exceeding three times the amount thereof.

24

May it please your Honors to grant unto your orator a writ of subpoena issuing out of and under the seal of this Honorable Court, directed to the said defend-



Bill of Complaint.

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ant Lambert Company, commanding it, by a certain day and under a certain penalty, to be and appear in this Honorable Court, then and there to answer to the premises, and to stand to and abide such order and decree as may be made against it.

And your orator will ever pray.

NATIONAL PHONOGRAPH COMPANY,

By WILLIAM E. GILMORE,

President.

26

ISHAM, LINCOLN & BEALE,

Solicitors for Complainant.

RICH'D. N. DYER,

Of Counsel for Complainant.

STATE OF NEW JERSEY, }  
County of Essex, } ss. :

27

WILLIAM E. GILMORE, being duly sworn, deposes and says that he is the president of the National Phonograph Company, the complainant named in the foregoing bill of complaint; that he has read the said bill and knows the contents thereof; that the same is true to his own knowledge save as to the matters therein stated to be alleged on information and belief, and as to those matters he believes it to be true, and that he verily believes Thomas A. Edison to be the first, original and sole inventor of the improved process of duplicating phonograms set forth in said Letters Patent numbered 713,209, referred to in the said bill of complaint.

28

WILLIAM E. GILMORE.

Subscribed and sworn to before me this 31st day of December, 1902.

A. WESTEE,

[SEAL.] Notary Public of New Jersey.



29

**Schedule A—Bill of Complaint.**

U. S. Patent Office

Mailed

May 28 1901

United States Patent Office. E. M. P.

30

Lambert v. Edison. No. 20,534.

Processes of Duplicating Phonograms.

Application of Lambert filed August 14, 1898. Patent  
No. 645,920.

Application of Edison filed March 5, 1898.

31

MR. THOMAS F. SHERIDAN, attorney for Lambert.

MESSRS. DYER, EDMONDS &amp; DYER, attorneys for Edison.

The issue in controversy is defined as follows :

32

“ The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and then outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement.”

**Complaint.**

Patent Office. E. M. P.

Edison. No. 20,534.

Applying Phonograms.

August 14, 1898. Patent

March 5, 1898.

Counsel for Lambert.  
Counsel for Edison.

defined as follows :

making record cylinders  
consists in first form-  
ing a layer of wax or  
other material, rendering the sur-  
face electrically conductive,  
depositing metal thereon  
when outwardly expand-  
ing the matrix a cylinder  
of sufficient thickness  
being and after the act  
of the matrix, and finally  
the tube by direct longi-

33

Both parties to this interference have filed state-  
ments and taken testimony in support of the same.  
Lambert, the junior party, alleges in his statement  
that he conceived the matter in issue in May, 1892 ;  
that he disclosed it to others in the summer of 1893 ;  
that he made a working model by his process in the  
fall of 1893 ; that he reduced the invention to practice  
in September, 1897, and that about two thousand  
record cylinders have been made by his process and  
placed upon the market.

34

Edison, the senior party, alleges in his statement  
that he conceived, disclosed to others, and reduced to  
practice the matter in issue in October, 1888. Edison  
bases his conception upon a caveat filed by him Octo-  
ber 26, 1888. He testifies that the process was first  
carried out by Dr. Schulzberg ; and that from the  
spring of 1889 his assistant, Wurth, has been practi-  
cally continuously at work on the process until the  
present time.

35

The testimony of Edison is fully corroborated by  
that of Wurth.

Before the date of taking the testimony in this case  
Dr. Schulzberg had died, but Jonas W. Aylsworth,  
who was employed in the same room as Dr. Schulz-  
berg, testifies to working with the latter in October,  
1888, and states that he saw Dr. Schulzberg carry out  
the process in issue in October, 1888.

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It must be held that Edison has proven reduction to  
practice prior to May, 1892, the earliest date alleged  
in behalf of Lambert.

Counsel for Lambert contends that Edison has for-  
feited his rights to a patent by reason of the lapse of  
time between his reduction to practice and the filing of  
his application. But this contention is not well  
founded for the reason that there is no evidence of  
inaction on the part of Edison in perfecting his inven-  
tion. Moreover, nobody had entered the field and  
given the invention to the public. Lambert does not  
claim to have given anything to the public until after



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the filing of his application which was a year subsequent to the filing of Edison's application.

38

Counsel for Lambert has also contended that there is no interference in fact between the applications of the parties for the reason that Edison employed the process in the production of wax cylinders which he heated to about 115° Fahrenheit, primarily to expand them into engagement with the interior surface of the matrix, which heating, as counsel for Lambert contends, does not soften the material of which the cylinders are composed.

39

Edison contends that such heating does soften the cylinders. There has been introduced into the record no showing or proofs that the wax cylinders when heated to 115° are not softened as contemplated in the issue of this interference. The Examiner is unable to find, either from the argument of counsel or from the experts in this office, any ground upon which to hold that Edison did not soften his material when it was heated to the temperature alleged.

Edison being held to have reduced to practice the matter in issue prior to any date claimed by Lambert, judgment of priority of invention is accordingly hereby rendered in favor of Thomas A. Edison, the senior party. Limit of appeal from this decision will expire June 17, 1901.

WALTER JOHNSON,  
Examiner of Interferences.

May 28, 1901.

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#### **Schedule B.—Bill of Complaint.**

No. 23,671. U. S. Patent Office, Aug. 13, 1901.

Before the Examiners-in-Chief, on Appeal.

In the matter of the Interference between the patent No. 645,920 to Thomas B. Lambert, granted March 20, 1900, on application filed August 14, 1899, and the ap-



chedule B.

hich was a year subse-  
pplication.

contended that there  
en the applications of  
Edison employed the  
wax cylinders which he  
it, primarily to expand

interior surface of the  
usel for Lambert con-  
erial of which the cylin-

beating does soften the  
roduced into the record  
he wax cylinders when  
as contemplated in the  
e Examiner is unable to  
t of counsel or from the  
nd upon which to hold  
his material when it was  
ged.

reduced to practice the  
ite claimed by Lambert,  
on accordingly hereby  
s A. Edison, the senior  
his decision will expire

WALTER JOHNSON,  
minor of Interferences.

# of Complaint.

at Office, Aug. 13, 1901.

rief, on Appeal.

erence between the patent  
mbert, granted March 20,  
ust 24, 1899, and the ap-

plication of Thomas A. Edison, filed March 5, 1898.  
Interference No. 20,534.

Improvement in Processes of Duplicating Phono-  
grams.

Mr. Thomas F. Sheridan for Lambert.

Messrs. Dyer, Edmonds & Dyer for Edison.

The issue is :

“ The method of producing record cylinders  
for phonographs, which consists in first forming  
a record on a cylinder of wax or other relatively  
soft material, rendering the surface of the wax  
cylinder electrically conductive, and electrolytic-  
ally depositing metal thereon forming a matrix,  
and then outwardly expanding under pressure  
within the matrix a cylinder or tube of softened  
material sufficiently thick to maintain its shape  
during and after the act of disengagement from  
the matrix, and finally removing the cylinder or  
tube by direct longitudinal movement.”

This issue is claim one of the patent to Lambert  
with a change in its punctuation. After Lambert  
had made the claim as punctuated in the patent, and  
while Lambert's application was yet in the Patent  
Office, the principal Examiner suggested this claim as  
then made by Lambert to the attorney for Edison  
whose application was also then pending in the Patent  
Office. The attorney for Edison failed to make the  
claim and cause it to reach the Patent Office in due  
time. Thereupon the application of Lambert went to  
patent. On knowledge of the patent, the claim one of  
the patent was made by Edison.

Whether this course of action makes the patent to  
Lambert one inadvertently or irregularly issued, so  
that it must be regarded in this proceeding as only an  
application for a patent, it is not now necessary to  
determine. Whether it be here regarded as a patent  
or as an application for a patent, our decision would  
be the same.

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But the history of the case above recited shows that the invention of claim one of the Lambert application at the time of its suggestion to Edison, or, which is the same thing, the invention of the same claim in the Lambert patent when Edison with knowledge of the product made in the claim, is the invention of the issue of this proceeding.

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So we look to the Lambert patent to determine the meaning of the issue.

The claim (one) of the Lambert patent is plain and distinct in its subject, so far as it states the procedure for making the matrix, excepting that the comma after "thereon" and the words "forming a matrix," raise a doubt whether or not "forming a matrix" means another step following the electro-plating—which step, in the description, is furnishing the backing for the matrix to make it strong to resist pressure—or whether "forming the matrix" is merely a statement of the result effected by the electro-deposition.

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As the Examiner who suggested the claim with that comma in it, has made it the issue here, without that comma it it, we take it that the words "forming a matrix" here means that the matrix is formed by electro-deposition, and that backing may or may not be applied.

The remainder of the issue requires :

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(1) That there shall be within that matrix a cylinder or tube of "softened" material, sufficiently thick to maintain its shape during and after the act of its disengagement from the matrix ;

(2) That that cylinder or tube within the matrix shall be outwardly expanded under the pressure within the matrix ;

(3) That, after such expansion, the cylinder shall be removed by direct longitudinal movement.

The specification of the patent states of the material of the cylinder or tube :

" I next take a soft ring of cellulose or vulcanized rubber either in a raw or partially-



Schedule B.

recited shows that  
Lambert application  
Edison, or, which is  
the same claim in the  
knowledge of the  
the invention of the

at to determine the

patent is plain and  
states the procedure  
that the comma after  
"a matrix," raise a  
matrix" means an-  
plating—which step,  
the backing for the  
resist pressure—or  
is merely a statement  
of deposition.

the claim with that  
here, without that  
the words "forming a  
matrix is formed by  
ing may or may not

res:  
that matrix a cylinder  
sufficiently thick to  
the act of its dis-

be within the matrix  
the pressure within

, the cylinder shall be  
movement.

states of the mate-

g of cellulose or vul-  
a raw or partially-

cured state or previously softened with some  
solution and of sufficient thickness to receive  
in perfect form the indentations of the matrix  
and at the same time furnish a suitable backing  
or support for the phonographic reproduction  
of the record. This relatively-thick ring or  
tube is then placed within the cylindrical open-  
ing of the matrix and by means of an expansive  
pressure with heat forced outwardly, completely  
filling the matrix and against the inner surface  
thereof, thus making a counterpart of the same  
and a record similar to that on the original wax  
cylinder. The ring thus formed, having on  
its outer face a faithful imprint of the  
matrix, is then allowed to harden, either  
naturally or by artificially curing the substance  
thereof, through which hardening it shrinks  
sufficiently to enable its subsequent removal  
to be made from the matrix without injury to  
either. As a shrinking or reducing medium, I  
have used a solution of hydrochlorous acid and  
water in which the tube and matrix are placed,  
as above, so that the tube can be removed from  
its engagement with the matrix."

It is contended on behalf of Lambert that "cellu-  
lose" means "celluloid." Without determining what  
meaning "cellulose" may be entitled to have in the  
specification of the patent, we may, for our present  
purpose, give to it the meaning of celluloid.

We have then here two kinds of tube material, one a  
tube of raw or partially cured celluloid or vulcanized  
rubber, originally made of the required degree of soft-  
ness, and another, a tube of celluloid or vulcanized  
rubber made originally hard and then softened by some  
solvent of celluloid or rubber. One kind of material  
is "softened" material and the other, first above men-  
tioned, is not "softened" material in the ordinary  
meaning of the word softened. It never was any  
harder than when made and used in the matrix. If

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the "softened" material of the claim and issue is to be restricted in meaning to material once hard and afterwards made soft, then the claim includes but one of the kinds of material mentioned in the specification as usable. But if the word "softened" be considered to mean "made soft"—*i. e.*, brought originally or subsequently to the requisite softness, and also capable of hardening or being hardened and of shrinking during hardening, then it will include, as it ought, both kinds of material mentioned in the specification as usable for the cylinder or tube.

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We regard softened material as including any material otherwise suitable which is normally harder than it is made to be when subjected to the expanding pressure within the matrix.

The "outwardly expanding under pressure" found in the claim is in the description "an expansive pressure with heat forced outwardly completely filling the matrix and against the inner surface thereof."

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"Pressure with heat" gives no idea of the specific means used to perform this important step of the process.

By examining the file of the application of Lambert we ascertain that the passage above cited from the specification is amendatory of the original specification. The displaced passage of the original specification reads as follows :

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"I next take a soft ring of cellulose or vulcanized rubber K, and place it within the cylindrical opening of the matrix, and, by means of pressure—hot air or steam—force it out to its largest diameter and against the indented inner surface of the matrix, thus forming a counterpart of same, and a record similar to that on the original wax cylinder. The cellulose ring is then permitted to harden, which it does rapidly, and shrinks or is shrunk in diameter by a reducing solution formed of hydrochloric acid and water, so that it can be removed from its engagement with the matrix."

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From this passage is deduced that no mention was originally made of the manner of preparing the material to make it soft; and that the pressure within the matrix was obtained by the use of hot-air or steam.

We do not mean to be understood as holding that claim one of the patent, now the issue, is to be limited to the use of hot air or of steam to effect the pressure. On the contrary the claim does not mention hot air or steam or even heat. The claim is broad enough to include the use of any means within the matrix and blank for affecting due, uniform pressure throughout the interior of the blank.

What we call attention to is that at the time of the filing of the application of Lambert the only means indicated by him for effecting the expansive pressure is "pressure with heat," and that by that is meant "pressure by hot air or steam." At the date of his application, that was the only means indicated by Lambert and was the means which he then indicated as efficient and which he then employed.

So this issue includes :

(1) Making the matrix as specified in the issue ;  
(2) Placing within the matrix a cylinder or tube of any suitable material made soft enough to yield uniformly to pressure applied within it and to receive due impression of the record from the inside of the matrix and capable of hardening or being hardened and of shrinking during hardening, the cylinder or tube being sufficiently thick to maintain its shape during and after the act of disengagement from the matrix ;

(3) Expanding that cylindrical or tubular material by outward pressure by any means within the matrix ;

(4) Removing the cylinder or tube by a direct longitudinal movement, in contradistinction to collapsing the tube radially and then withdrawing it lengthwise from the matrix, or to removing it lengthwise by a screw movement, both modes of withdrawal being old in the state of the art divulged in the records of the applications.

This issue is not confined to the use of any specifi-

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cally named material for the blank, neither to cellulose, to celluloid nor to vulcanized rubber. It may include wax.

Nor is it confined to any specific means for effecting uniform expanding pressure within the matrix. It may include a dynamic means.

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As described in the specification the process is one in which the tube of softened material is made soft before it is put into the matrix. But the claim here in issue is not limited to that time or place for the formation of the softened material. All the issue requires in this respect is that the softened tubular material shall be outwardly expanded under pressure within the matrix. This condition of the issue is satisfied equally whether the tubular material be made soft before or after it is placed within the matrix.

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So the issue is generic as to the kind of softened tubular material, the time when or place where the tubular material is softened, and the means for effecting the expanding pressure within the matrix.

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Edison the senior party, alleges in his preliminary statement that he conceived the process of this issue, disclosed it to others and reduced it to practice in October, 1888; and that he has since that time continuously practiced the process at his laboratory at Orange, N. Y., for making duplicate phonographic records. He fixes the date of his conception by a caveat which he caused to be filed in the Patent Office on October 26th, 1888. He makes exhibit of a portion of the description of that caveat (printed at page 38 of his record) which reads as follows:

“For reproducing records, or rather duplicating the same I coat the surface of the cylinder with say silver by electro-vacuum process, then plate the outside 1/8 inch thick with copper, put the cylinder on a mandril, true the outside by grinding to a taper, fit this in a taper steel die, then dissolve wax or other material out, and then put in a blank cyl-

Schedule B.

ank, neither to celluloid rubber. It may in-

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on the process is one in which the material is made soft before the claim here in issue for the formation of the issue requires in this bular material shall be sure within the matrix. satisfied equally whether it before or after it is

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the Patent Office exhibit of a portion printed at page 38 of ows:

cords, or rather dupli- at the surface of the by electro-vacuum pro- side 1/8 inch thick with inder on a mandril, grinding to a taper, lie, then dissolve wax or the put in a blank cyl-

inder of plastic (when hot) material, force in a plunger, spread the same against the record and then allow the same to cool. It will contract sufficient away from the record to allow of its being taken out."

The purpose of the procedure is to reproduce tubular wax records. Wax records are known to be of sufficient thickness to maintain their shape during and after the act of disengagement from the matrix. While hot, they are expanded by a plunger. They are then allowed to cool until they have contracted sufficiently to be taken out from the matrix. That taking out of a cylindrical integral blank from a cylindrical integral matrix must have been by a direct longitudinal movement.

The deposit of a coating of silver on the wax-record is apparently the "rendering of the surface of the cylinder electrically conductive," the electro-deposition of 1/8 inch of copper "forms" the matrix, as well when the silver deposit remains as when there is a carbon deposit which does not remain.

The wax record is hot. Being hot it must have been somewhat softened. After it was softened by the heat the plunger within the matrix and blank effected the expanding pressure within the blank.

On its face, this exhibit appears to disclose a conception of this broad issue.

But when Edison comes to testify of the manner in which Dr. Schulzberg, who was not living at the date of Edison's testimony, first carried out the process under his, Edison's, direction in October, 1888, he does not disclose the process exactly as it appears to be in the caveat. Edison testifies:

"Q. 9. How did Dr. Schulzberg make the molds or matrices?"

"A. By an electro-vacuous deposition of the vapor of gold on the surface of a phonographic record cylinder, and then placing the same in an

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electrolytic deposition bath of copper, and plating a thick coating of copper over this cylinder, and finally dissolving or melting out the original waxlike record. This shell was backed up by being turned and put into a stronger shell, and into this was placed a smooth blank cylinder of the ordinary commercial thickness at a low temperature, and then by heat and pressure the same was expanded so as to fill the indentations composing the record on the matrix. Afterwards the whole was chilled down to a low temperature, the waxlike material contracting in a greater ratio than the matrix permitted it to free itself from the same, and was taken out longitudinally."

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One difference from the caveated process is using a vapor of gold instead of silver. The blank was put into the matrix at a low temperature. Then "heat and pressure" was supplied in some unknown way. He expressly states that the record was removed by chilling both matrix and record and removing the record longitudinally.

Jonas W. Aylsworth describes the process which he saw Dr. Schulzberg carry out in October, 1888, as follows :

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"A. 9. He had a mold similar to that (the witness refers to "Edison Exhibit, Original Schulzberg mold") and he placed a cylinder of wax composition inside of it, and then sealed the ends around the joint between the mold and the cylinder with wax, and then placed it in a bath of warm water that was capable of being sealed up and connected to a hydraulic press, so that he got the pressure of the water in this reservoir, where he had the mold, the idea being that the water would press against the inside of the cylinder and against the walls of the mold, so as to force the cylinder into con-

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the cylinder into con-

tact with the record on the inside of the mold.  
Then he removed the mold and cylinder, and  
subjected them to cold to allow the wax to con-  
tract loose from the mold, after which the  
duplicate copy so obtained was removed by  
direct longitudinal movement."

This witness also testified that he saw the molds  
made by coating the original wax-record with silver  
and then electroplating on that coating a plating of  
copper.

So this is specifically what Dr. Schulzberg did in  
October, 1888.

The record blank and the mold enclosing it were  
placed in a hot-water bath and pressure applied to the  
hot water within the blank and matrix to force the  
cylinder into contact with the record on the inside of  
the matrix. So heat and pressure were simultaneously  
applied to the cylinder.

As to this first process, the question is raised whether  
the cylinder which unquestionably is outwardly ex-  
panded under pressure within the matrix, was one of  
softened material.

As to this, on cross-examination, Aylsworth testi-  
fied :

"x-Q. 18. You couldn't tell of your own knowl-  
edge, could you, whether these phonogram du-  
plicates being made were softened or not ?

"A. Well, I know, as a chemist, that the hot  
water that he put them in must have softened  
the wax.

"x-Q. 19. About what temperature was the  
water do you know ?

"A. Well, I know it felt warm to the hand.

"x-Q. 20. Somewhere around 100° to 115° ?

"A. Yes, fully that; perhaps more than that.

"x-Q. 21. The hot water running through  
there was for what purpose—to expand it by  
heat or to soften the records ?

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"A. To soften the records or expand both. He had them fit very close, and naturally it would expand at the same time that it softened.

"x-Q. 22. Leaving out any incidental things that may follow from running the hot water through there, what I want to know is, was the hot water run through there for the purpose of expanding the records or was it run through for the purpose of just softening them?

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"A. I think more for softening them, and depending further on the pressure for expanding."

He also testifies :

"Re-d. Q. 31. Were the duplicate records which you say you heard reproduced in 1888 distinguishable ?

"A. Oh, yes, it was quite as good as the original selection at that time."

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It will be observed that the above first process was not the one caveated in October, 1888. The latter used a mandrel for final expansion.

Edison testifies that in the spring of 1889 Charles Wurth was put at work with Dr. Schulzberg, and that he has been practically continually at work on the process from that to the present time—under his, Edison's, directions.

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Charles Wurth testifies that he began work under direction of Prof. Schulzberg in November, 1888, and that before 1891 he made some reproduced records. Of these he testifies :

"Q. 10. Please describe the process which you carried out in the making of these copies?

"A. I helped to make the masters, or we got them from the man who had charge of taking the original records on wax cylinders, and then we put them in a vacuum chamber, a glass globe which was exhausted afterwards, and anodes of

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different metals; we used platinum and silver  
and gold to deposit a film of metal on the out-  
side of the master or original record; and after  
that we connected that to an electrical con-  
ductor or wire that we attached to the ends of  
the original as plated and put them in a copper  
solution, solution of sulphate of copper, and ap-  
plied electric current to make a deposit on the  
plated master. After that we took that master  
out again; first we boiled it out, and afterward,  
to save the master, we shrank it by cold out of  
the copper shell which was thus obtained, so that  
the copper shell was the mold then that carried  
the record on the inside. After the matrix was  
made and duly trimmed up on both ends, we  
took a blank cylinder of the same wax, the same  
material, and shaved it down to a certain size, so  
that we could cool it and insert it into the mold;  
sometimes I made it within .002 of an inch (first  
I made them .002 of an inch larger than the  
mold is on the inside) and cooled it—put it  
in the ice-box and let it cool down, so that it  
would shrink small enough so as to allow it to  
go into the mold, the matrix. After that we  
clamped the whole matrix between two end  
rings to hold the blank and mold in place.  
After that we took a hollow core of brass and  
heated that with water, let hot water run  
through, and when it had a certain temperature  
I put the blanks in the mold right over the core  
and let the heat expand the cylinder—the blank,  
inside the mold. After that I reversed the  
whole thing—set it on a ring, and pressed the  
core down a little further, so as to give it more  
pressure sideways. After that we pushed the  
core out, and put the whole thing into the ice-  
box again—the mold and the blank inside and  
all—and waited a little while until the duplicate  
was small enough to withdraw it easily by a  
longitudinal movement."

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This appears to be the caveated process. The blank cylinder is first heated by the heat from the hot metal core and afterwards the hot blank is expanded by pressure within the mold effected by advancing the core, which is a taper core.

Charles Wurth testifies that this is the process which was followed up to the date of the testimony. It is the preferred process of Edison's application.

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Wurth testifies that the duplicates made in 1891-2 by this process were of the thickness of ordinary phonographic records and that they were withdrawn longitudinally while rigid. It is clear from the testimony, that the products of the process as early as 1892 were perfect for their purpose and were made use of industrially and successfully.

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This process is attacked by Lambert on the ground that the thin deposit of gold or silver is not a deposit for rendering the wax blank electrically conducive. The witnesses for Edison testify that it is. The principal Examiner has held it to be that, and an equivalent for that purpose of the plumbago used by Lambert, notwithstanding that the plumbago does not and the gold or silver does become incorporated in the body of the matrix. Of this Edison testifies as follows :

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" Re-d. Q. 59. And I understand that that vacuous deposit is used only as a conducting coating for the coating for the electrolytic deposit.

" A. Yes, sir."

And Charles Wurth testifies :—

" x-Q. 69. Now, as regards the making the matrix, the deposit *in vacuo* of a metallic film upon the original master was done for the purpose of getting and forming the indentation of the matrix ?

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"A. Yes, sir; getting the conducting metallic surface on the master.

"x-Q. 70. Now, the electroplating on that was to form a backing and support for that electro-vacuous deposit?

"A. No, it is not exactly like that. The plating in vacuum is to give the master record a metallic conducting surface, so that the copper will deposit on there, because the wax itself is non-conducting; it wouldn't deposit on the bare wax."

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Besides both Edison and Charles Wurth testify that they first used plumbago as a conductive coating and abandoned it for their present method of getting such coating.

The contention is made by Lambert that in this process the tube is not softened.

Edison testifies :

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"x-Q. 33. In expanding these phonograms to get the impression from the matrix, you didn't do any preliminary softening, did you ?

"A. Yes, sir.

"x-Q. 34. How did you soften them ?

"A. By heating.

"x-Q. 35. Did you heat them to soften them ?

"A. Yes, sir; heated the matrix mold and all.

"x-Q. 36. That is, to soften the record ?

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"A. Yes, sir.

"x-Q. 39. There was no preliminary softening, though, before the phonogram was placed in engagement with the mold ?

"A. No, sir.

"x-Q. 40. Mr. Wurth further said in that affidavit that this heating does not in any way affect the brittleness of the blank, nor does it make it plastic; is that true ?

"A. No, sir."



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"x-Q. 57. How soft do you suppose those wax phonograms were when you were heating them ?

"A. Soft enough to flow viscously and fill the indentations on the matrix, or the record on the matrix, under pressure."

Charles Wurth testifies :

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"x-Q. 66. Did you, or did you not, soften any of these phonograms in making them, preliminarily ?

"A. Not preliminarily ; they were not softened except to heat them so much that they would take the impression after they were introduced into the mold."

"Re-d. Q. 88. When you subject the blanks to heat, Mr. Wurth, does the surface become plastic enough to receive an impression ?

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"A. If you heat it enough, yes. It will receive an impression practically cold, but so slight that it is useless. You have to heat it to a certain degree to make the wax soft enough to take the impression perfectly."

The evidence is that the blanks are softened in this process.

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There is no real contradiction between the averments of Wurth in his affidavit made during the prosecution of the application and his testimony in this proceeding. There is a difference of opinion between him and Edison as to what constitutes plasticity. Both agree that the wax cylinder is softened for the same purpose.

It is also in evidence that celluloid records were made by this process without softening the blank before it is put into the matrix ; that they cannot be made by heat alone but can be made by heat and pressure, the pressure being greater than that needed for wax cylinders (Chas. Wurth, x-Q. 64 to 65, 78 to 82 ; Edison, x-Q. 25, 26, 27).

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It appears from this testimony that Edison success-  
fully practiced this process on wax cylinders as early  
as 1891, and that he has since that time been engaged  
in perfecting it in details to make it industrially  
economical; and also that in 1889 he made celluloid  
records by this process. He made application for the  
process on March 5, 1898.

Lambert alleges that he conceived of the invention  
in May, 1892; disclosed it to others in the summer  
of 1893; made a working model in the fall of 1893 by  
this process; that he embodied a full-sized apparatus  
and with it reduced this invention to practice in Sep-  
tember, 1897, at 67 and 69 Lake St., Chicago, Ill.; and  
that he has marketed about 2,000 record cylinders made  
by this process.

He filed his application on March 20, 1900.

Our findings on behalf of Edison place his reduction  
to practice before the date of conception alleged by  
Lambert. And the filing of the application of Edison  
was two years prior to the filing of the application of  
Lambert.

So Edison is first to conceive, to reduce to practice  
and to file his application; and all that Lambert alleges  
is a later conception and also a later reduction to practice  
about four months before Edison filed his application.

Edison is first in every act of invention and first in  
filing an application containing the invention.

A conception by Lambert later than Edison's con-  
ception and a reduction to practice by Lambert later  
than Edison's reduction to practice avails nothing for  
Lambert. Nor does Lambert's patent, granted on an  
application later than Edison's application and while  
Edison's application was pending, constitute any bar  
to the grant of a patent to Edison on his application.

The right to the invention was vested in Edison by  
actual invention of and industrial use of the invention  
prior to the application for that patent.

Edison cannot be held to have forfeited the invention  
to Lambert by failure to file his application, for he  
filed first, nor by failure to make the claim, for he

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made it so soon as he knew of Lambert's patent covering the claim.

Moreover the claim was made only four months after Lambert's alleged reduction to practice and before any use of the invention to make it known to the public.

Manifestly Lambert has no case on his pleadings.

But Lambert's case is not so strong as his pleadings.

102 There is not enough in his own testimony, if taken to be true, to satisfactorily establish that he ever had any process, much less the present process, for making stable records prior to the year 1897. This is evident from his answers on cross-examination.

Also, it is evident that he never disclosed the process to his witness Taylor (x.Q. 34) and Taylor's evidence does not show any disclosure of it to him.

103 Up to October, 1897, according to his own testimony, Lambert had not explained this process to any one. He testifies that in October, 1897, he disclosed it to his witness Hamilton, and that between that time and the summer of 1899 he did not disclose it to any one. It was in the summer of 1899 that he met Mr. Philpot, who aided him financially.

Now he says that Hamilton, in October, 1897, saw him carrying out the process *with a thick ring*. That is his testimony as to the disclosure.

Hamilton testifies that he saw Lambert make a record in September or October, 1897, and that he saw others which Lambert said that he made.

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" Q. 8. Were these records thin, so that they would collapse easily in the hand, or were they thick enough to be self-sustaining ?

" A. They were of varying thicknesses ; some of them were thin, and his aim seemed to be to obtain material by which he could make them thick enough not to collapse.

" Q. 9. I now hand you a record marked "Exhibit Lambert's 1897 Matrix" (Record) and ask you if you have ever seen anything like it ?

Rule B.

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"A. Yes, sir. I cannot tell whether it is the identical record, but it looks like one I saw Mr. Lambert make at 69 Lake street along sometime in the fall of 1897."

In answer to Question 10, p. 37, Hamilton states what he saw Lambert do in October, 1897. The first part of the statement is that he saw him make a matrix as this issue requires that it should be made. Then he described backing the matrix and then proceeds as follows with his story of what he saw Lambert do:

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"He then took a sheet of celluloid, or a strip, and softened it by dipping it in hot water, brought the two ends together and cemented them so as to form a ring just a trifle smaller than the inside of his matrix. Then he dropped his ring into the matrix and filled up the cylindrical space in the inside of the celluloid ring with rubber or some similar material. I think that was his first trial. He then put them into a vise and squeezed the rubber longitudinally, the idea being to have the rubber expand the celluloid cylinder up against the matrix. Before that was done the celluloid was heated in hot water and softened. After it had been in the vise, as he thought, long enough to set it up—perhaps three, five or ten minutes—the vise was loosened and the rubber, celluloid and all put into cold water, when it could be pulled out by hand."

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On cross-examination Hamilton testified:

"x-Q. 1. You say, Mr. Hamilton, in describing the process which Mr. Lambert carried out in your presence in the fall of 1897, that he took a sheet or strip of celluloid and made a ring out of it; what was the thickness of this sheet?"



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"A. I do not know what the thickness was—they were thin; about like a sheet of paper; perhaps a little heavier.

"x-Q. 2. After the impression was made on this ring of sheet celluloid was the celluloid mounted on a backing?

"A. Yes, sir."

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"Re-d. Q. 1. Do you mean by your last two answers to state that the celluloid ring which you saw formed, or was explained to you by this process, was so thin that it would not stand up?

"A. It is really impossible for me to tell you as to whether he formed the impression on the thin ring and then backed it up or backed it up first.

"Re-d. Q. 2. The records you saw produced, however, were self-sustainable, were they not?

"A. Yes, sir."

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Now there is nothing proven by this testimony more than is stated by Lambert that he did in the summer and fall of 1893. See his answer to Question 21. It is the same old rubber-plug and vise apparatus operated on a celluloid cemented-edge ring of the thickness of paper.

112

His own description of the 1897 procedure (answer to Question 24) and of subsequent discoveries and improvements (answer to Questions 24 and 29) disclose three means for expansion (1) a rubber plug, (2) a printer's-roll composition and gelatine and (3) a sectional expanding mandrel. And these answers disclose that there was difficulty in maintaining the joints of his rings made of sheets and in the softening of the blanks, and in determining the time which should elapse, between the covering of the ring with the solvent and the forcing of it into the matrix. Now the rubber-plug device was his first device. It was not until afterwards that he discovered the cement for making proper joints and the proper

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interim between coating with the solvent and pressing.  
And when we come to his application we find all of  
these means for compression thrown away and hot air  
and steam used in their stead, and we find nothing of  
cylinders made of sheets cemented at their edges or  
of these sheets first made and then backed by thick  
rings.

And there is no testimony that any of the records  
made by him in 1897 were successful in use. And not  
one of them is produced.

He decries in his patent the making of records from  
thin plates and gives the reason why they will not  
produce true records, and yet he has no evidence cer-  
tainly establishing that he had in 1897 worked this  
process in such a manner as to produce a thick record  
of commercial thickness by pressure within the matrix.  
There is nothing more proven in 1897 than the old  
thin-paper thickness ring with cemented joints which  
he had been making since the fall of 1893, made by  
the first devised crude extemporized apparatus.

We cannot regard a process which has not been ex-  
ecuted to make the product which his patent calls for,  
as reduced to practice.

He had conceived of a process the same in general  
steps as this, which would form rings too thin for use as  
records. But he had not then conceived of the changes  
by which that process was afterwards converted into  
one which will make the stable rings of commercial  
size, length and thickness which his perfected exhibits  
present and which his patent calls for. When that  
was first done is not proven. It is proven that none  
were put on the market until after his application was  
filed, which was more than two years after his October,  
1897, experiment in the presence of Hamilton.

His own conduct is ample proof that he did not have  
this process until after the summer of 1900.

According to the evidence he was a poor man in  
1897, for from that time on he had no salary and had  
a wife and child and was earning only about \$30 a

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month, and had hired a shop with the privilege of paying for its rent what he could and when he could.

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Yet then, as he contends, he had perfected this process and had achieved his purpose of making an infrangible celluloid record. If he had, there was, and he knew there was, a relief from his impoverished condition. Yet from 1897 to 1900 he neither explained this process or showed its product to any one. He says they had no confidence in him. It was not needed. What was needed was confidence in his invention. That would have come and the money to back it, by showing the new infrangible commercial records giving as good sound as the frangible wax records. He had the process perfected for making them. He had made fragmentary records. It cost almost nothing to make a few records and show them. He not only never made one complete, which is a fact significant that he knew that there was no use in trying to make one complete until he could make a fragment complete and practical in use—but he has not kept a single one of his incomplete productions of 1897 or any record formed anterior to the filing of his application.

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The conclusion is inevitable that his exhibition to Hamilton in 1897 was one of an unsuccessful experiment, and that it was not long after that when he had obtained an apparatus fit to make records of commercial length and thickness carrying records which reproduced the sound as excellently as the original record, or had conceived of and practiced the details of the process necessary to be followed in working the proper apparatus.

A process is not perfected until it is wrought to effect its result; nor, when its result is a product, until it has produced the perfected product fit for industrial use.

That affair of 1897 was not a reduction to practice of the process of this issue. It can only with difficulty be accepted as a disclosure of a conception of the issue.

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If so accepted, Lambert has a conception only prior  
to Edison's application.

It is urged on behalf of Lambert that Edison's ap-  
plication does not disclose the process of the issue and  
that consequently there is no interference in fact be-  
tween the two applications or between the application  
and the patent as the case may be.

The contention specifically is as to fact, that the soft-  
ening of the wax cylinder is not disclosed in the Edi-  
son application.

This matter is within our jurisdiction only for con-  
sideration whether we shall act under Rule 126.

The question is one of fact, dependent on the action  
of a wax ring of considerable diameter and thickness  
under the influence of heat to change its size to a very  
small extent, and to enable it to receive impressions in  
depth so small as one one-thousandth of an inch.

In such a case and in the presence of the testimony  
of experts in handling wax records, we decline to ex-  
press any opinion as to this question of fact or as to  
the question of an interference in fact.

Especially do we decline for the reason that two  
tribunals of this Office have held that there is an in-  
terference in fact and have so held on the face of the  
applications.

The decision of the Examiner of Interferences award-  
ing priority to Edison is affirmed.

Limit of appeal expires Sept. 12, 1901.

S. W. STOCKING,  
J. H. BRICKENSTEIN,  
Examiners-in-Chief.

I am of the opinion that priority should be awarded  
to Edison, and to this extent I concur in the decision  
of my associates.

I am, however, in considerable doubt whether the  
"softened material," of the issue which is a claim of  
Lambert's patent, may properly be regarded as an  
equivalent of the wax which Edison employs.

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## 32 Bill of Complaint—Schedule C.

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This question has already been passed upon by the Commissioner, and I do not, therefore, consider that it is necessary for me to now discuss it at length, especially as it will, in all probability, be again brought to the Commissioner's attention by the appellant.

T. G. STEWARD,  
Examiner-in-Chief.

126

**Schedule C.—Bill of Complaint.**

Intf. No. 20,534  
Oct. 22, 1901.

S. E. T.  
F. V. M.

## UNITED STATES PATENT OFFICE.

LAMBERT V. EDISON.

127

Process of Duplicating Phonographs.

Appeal from Examiners-in-Chief.

Patent granted Thomas B. Lambert March 20, 1900,  
No. 645,920.

Application of Thomas A. Edison filed March 5,  
128 1898, No. 672,650.

MR. THOMAS F. SHERIDAN for Lambert.  
MESSRS. DYER, EDMONDS AND DYER for Edison.

This is an appeal by Lambert from the decision of the Examiners-in-Chief affirming the decision of the Examiner of Interferences awarding priority of invention to Edison.

been passed upon by the  
therefore, consider that it  
discuss it at length, especi-  
y, be again brought to  
by the appellant.

T. G. STEWARD,  
Examiner-in-Chief.

### of Complaint.

S. E. T.  
F. V. M.

### PATENT OFFICE.

EDISON.

ing Phonographs.

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Lambert March 20, 1900,

Edison filed March 5,

for Lambert.

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The invention is defined in the following claim :

“The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and then outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement.”

Upon this appeal the questions of interference in fact, and of Edison's right to make the claim of the issue have been argued by the counsel for Lambert.

The right of Edison to make the claim was decided by the Examiner in a well considered opinion rendered August 21, 1900. In this same decision, the Examiner also decided that there was no irregularity in the declaration of the interference such as to preclude a proper determination of the question of priority, and that there was an interference in fact.

The decision on the last two grounds was affirmed by the Commissioner on appeal under date of November 14, 1900.

Under these circumstances, only a clear and unmistakable error in the decision of either of these tribunals would warrant a rehearing of the questions raised, which questions have been settled in the usual course and in the regular way. It would be a very unusual proceeding to set aside either of these decisions, and it follows that such a course would be taken at this time only upon unusual circumstances.

There must be some stability in the decisions which have been rendered by the various tribunals of the office, and decisions once rendered will not be set aside

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unless the reasons for so doing are very clear and convincing.

These same questions were presented before the examiner of interferences and the examiners-in-chief when this interference was before them on the question of priority. A request was made to each of these tribunals to exercise their prerogative under rule 126, because of these same alleged irregularities, but the request was in each instance declined.

134

Lambert insists that the issue is confined to a method of making an indestructible record, and must be limited to a record made of the material specified in his patent.

In the patent the materials specified are "cellulose or vulcanized rubber." A patent should be held strictly to the statements made therein. Lambert, however, states that he used the word "cellulose" unadvisedly; that he intended to use the word celluloid, not appreciating at the time the difference in meaning between the two words. Inasmuch as the alternative material specified by Lambert, "vulcanized rubber," is not an equivalent of cellulose for the purpose specified, but is an equivalent of celluloid, it may well be assumed without doing violence to the rights of others that Lambert really meant to use the word "celluloid," and that the word "cellulose" was not used advisedly, but was used inadvertently.

135

The issue is a broad one. It is not limited to a process carried out solely with the use of celluloid. It is not even stated that the method results in the production of an indestructible record. The word "indestructible" is a relative one. The material of which the record is made is referred to in the issue as "a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix."

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It is true that the issue is the claim of the Lambert patent. It is argued that the issue should be construed with reference to the disclosure in this patent. The Lambert patent states that

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the material used is "cellulose (celluloid), or vul-  
 canized rubber." The issue is not limited to these two  
 materials, but to any equivalent materials capable  
 of expansion and contraction, and of being rendered  
 sufficiently soft to take the impression of the matrix  
 and to subsequently harden in order that the record  
 may remain intact. Lambert mentions but two ma-  
 terials. Edison mentions more than two, among them,  
 however, are the two mentioned by Lambert.

Counsel for Lambert also contends that the material  
 used by Lambert is softened previously to its being  
 placed in the matrix mold, and that such is not the  
 case with Edison. The essential thing is that this  
 material if too hard to receive the matrix impression  
 may be sufficiently softened to receive the same. Of  
 course, this softening must occur before the material  
 is made to take against the matrix. It is clear that  
 this is done in both cases. In Edison, heat is applied.  
 It is true that Edison does not explicitly state that the  
 material is "previously softened." He does state,  
 however, that heat is applied. Now, this description  
 is sufficiently clear to any one skilled in the art to un-  
 derstand that materials such as used are softened by  
 this application of heat. The law only requires that  
 the description should be sufficiently clear that it may  
 be understood by any one skilled in the art. With  
 this requirement Edison has fully complied.

In view of the reason above stated a reconsideration  
 of the questions of irregularity in declaring the inter-  
 ference, of interference in fact, and of the right of Edi-  
 son to make the claim, is refused.

Lambert points out that the claim was not made by  
 Edison until after the grant of the patent to Lambert,  
 and that therefore the burden should not be on the  
 latter.

Notwithstanding the fact that Lambert is a patentee,  
 the application on which said patent was granted was  
 pending contemporaneously with the application of  
 Edison.

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Under the provisions of rule 116,

" \* \* \* the several parties will be presumed to have made the invention in the chronological order in which they filed their completed applications for patents clearly illustrating and describing the invention ; and the burden of proof will rest upon the party who shall seek to establish a different state of facts."

142

The date on which the claim is made is immaterial as far as the burden of proof is concerned.

The facts here are similar to those considered by the Court of Appeals in *Miehl v. Read*, 96 O. G., 426, in which it was held that the senior applicant is entitled to all the advantages which his earlier application gives him, notwithstanding that the junior party is a patentee.

143

It may be stated, however, that whether or not Edison be required to make out a case beyond a reasonable doubt, the conclusions herein stated would be the same as to the question of priority of invention. Edison was the first to file his application—namely, on March 5, 1898. Lambert's date of filing is August 14, 1899, more than seventeen months after that of Edison.

144

Lambert alleges a conception of the invention in 1892. His conception at this time, however, does not appear to have been anything more than an idea came to him that a record made of a more indestructible material than the ordinary wax record would be a good thing.

There is nothing in evidence tending to show that he had at that time a clear conception of the process defined in the issue, in the performance of which an indestructible record could be produced. Lambert alleges in his preliminary statement and testifies to the fact that in the fall of 1893 (Q. 16) he disclosed the invention to one Taylor, and that in 1895 he again disclosed the invention to one Hamilton.

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The issue is explicit in its requirement that phono-  
gram records be made of a "material sufficiently thick  
to maintain its shape during and after the act of dis-  
engagement from the matrix."

With regard to this point, the Examiner states in his  
decision of August 21, 1900:

146

"As originally filed, neither of the specifica-  
tions involved in this interference contained any  
reference to the thickness of the record material. This feature was first introduced into both for  
the same reason, viz., to avoid the English  
patent to Young, which describes a cylinder of  
very thin celluloid; it was supported in both  
cases by supplemental oath; and it was ad-  
missible in both cases for the same reason, viz.,  
that both showed cylinders of thick material in  
the drawings as originally filed. The thickness  
of the record material was first mentioned in the  
Lambert case in an amendment of Nov. 22, 1899,  
and in the Edison case in an amendment of  
March 21, 1900. The introduction of this fea-  
ture did not change the original invention in  
either case; but both applicants, in the progress  
of the examination of their cases, found it ad-  
visable to emphasize a feature at first supposed  
to be either altogether unimportant or else such  
as would be taken for granted."

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The testimony is quite clear and convincing  
as to the point that up to the fall of 1897,  
the date of Lambert's alleged reduction to  
practice, in all the experiments that Lambert  
had made, he had not reproduced any records  
other than upon very thin sheets of celluloid. These  
sheets were not of sufficient thickness to maintain their  
shape. Lambert had not progressed any farther in  
the art than had Young when he (Young) obtained his  
patent.



149

The preliminary statement of Lambert concludes as follows :

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“ that he embodied a full sized apparatus and reduced it to practice in September of 1897 ; and that in such reduction to practice, a full sized apparatus was successfully operated in Chicago, Illinois, at 67 and 69 Lake Street same place, and that about two thousand of these record cylinders have been made, placed upon the market and successfully operated, by the process contained in the first claim of his patent declared to be involved in this interference ; and that wherever used they have given satisfaction.”

In support of this allegation, Lambert testifies as follows :

151

“ Q. 24. What did you do, if anything towards reducing this invention to a commercial form—that is, to practice—and when did you do it ?

152

“ A. I reduced the process to practice about September, 1897. I took ordinary wax records, and by means of a multiplying pointer graphically reproduced the sound waves on a glass covered with lampblack. These I placed in a magic lantern or projecting machine in order to study the sound waves, so that I could compare the results which I got with those of the wax records which I was copying. This was done both at my home and at 67 and 69 Lake street, fourth floor. I was then making, as I found time, matrices electrolytically, deriving my current from a storage battery, and from these matrices I made practically sound records of celluloid. These records were made on the inside of a matrix by placing previously formed rings of celluloid, made out of sheets, therein and outwardly expanding them, in some cases by the use of a

Lambert concludes as

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rubber plug or by the use of gelatine and  
printer's roll composition, and also by a sec-  
tional expanding mandrel caused to expand by  
the driving in of a tapered plug. The celluloid  
in some instances was softened by means of  
heat alone, and in some instances by means of  
a solvent of celluloid previous to the expansion  
pressure. I found that in using solvents of  
some characters, when put too freshly into the  
matrix, they would adhere to the copper of the  
matrix in such a way as to prevent its easy  
and immediate removal. In such cases I used  
paraffine oil to prevent what I then thought was  
the attacking of the copper by some material,  
either in the celluloid or in the solvent. By  
softening the material with the solvent I found  
that the detail of the record was more easily  
and more faithfully reproduced than by using  
heat alone to soften it, in which latter case I re-  
quired very much more pressure to accomplish  
the same result. 154 155

"Q. 25. Was the heat independent of the  
pressure, or was the heat used solely for the  
purpose of softening the celluloid record?

"A. The heat was used solely for the pur-  
pose of softening the celluloid record.

"Q. 26. In this reduction to practice which  
you have spoken of, did you take any one into  
your confidence or not?

"A. I did, I took Mr. R. E. Hamilton into  
my confidence and showed him the results. 156

"Q. 27. Did he understand the process at  
that time?

"A. Yes, sir, he did.

\* \* \* \* \*

"Q. 31. How many phonograms did you  
reduce to practice during that period, the fall  
of 1897?

"A. Probably ten or fifteen, possibly more.



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"Q. 32. Did you try any of these phonograms so reproduced on a machine?

"A. I did. I tried them on a lathe which I used as a phonograph at the time, both for recording and reproducing.

"Q. 33. Did you try it on the phonographs on the market at that time?

"A. I did. I also tried it on other phonographs at my home.

158

\* \* \* \* \*

"Q. 55. Have you any of the apparatus and phonograms which you say you used for reduction to practice with you now?

"A. I have, and here produce them.

"Q. 56. The only part of the apparatus which you seem to have left of your 1897 experiment is a matrix. Will you please state of what it is made, and how?

159

"A. The matrix was made by electrolytically depositing copper on the surface of a wax record, by having previously made the surface of such wax record conductive by an application of graphite. After the deposit of copper had attained the thickness shown here, the wax record was removed therefrom and then the matrix itself was forced upon another wax blank, which acted as a mandrel, which was placed in a lathe. I then squared the ends of the matrix, and then set it on a level plate on the inside of the brass ring and poured plaster of paris in liquid form in the intervening space, thus forming a backing to hold the matrix in its cylindrical shape.

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"(The matrix referred to above by the witness is herewith offered in evidence, and the notary is requested to mark the same 'Exhibit Lambert's 1897 Matrix').

"Q. 57. I notice that part of the exhibits which you have brought with you is a repro-

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part of the exhibits  
with you is a repro-

duced phonogram. Will you please explain in  
what it was made and how?

"A. This phonogram was made in the matrix  
I have just described by first forming a ring of  
thin red celluloid and also a ring of heavier  
white celluloid of a different character. These  
were made so that the red ring would exactly  
fit on the outside of the white ring. The com-  
posite ring was then submitted for a short time  
to the action of a solvent of celluloid. A short  
time after the application of the solvent the  
ring, being softened by the application of said  
solvent, was placed within the matrix and an  
outward pressure given to it by means of a rub-  
ber plug; and it was then caused to expand by  
applying a screw pressure to its axes, so as to  
squeeze it longitudinally and expand it radially.  
After remaining under pressure for a short time  
and in contact with the interior surface of the  
matrix, the pressure on the rubber was removed  
and the record taken from the matrix by a  
longitudinal movement.

"(The phonogram referred to by the witness  
is herewith offered in evidence, and the notary  
is requested to mark the same 'Exhibit Lam-  
bert's 1897 Phonogram.')

It is here noted, and this point is very important,  
that Lambert does not state in his answer to Q. 57  
that the record filed (Exhibit Lambert's 1897 Phono-  
gram) was made in 1897 in his 1897 matrix. The date  
when this phonogram was made is nowhere stated  
in evidence. To state that this phonogram was  
made in the 1897 matrix is a far different  
thing from saying that it was made in the matrix in  
1897. In order to prove a reduction to practice in  
1897, this point is essential. On this point Lambert's  
only corroborating witness does not help him out.  
Lambert goes on to testify:

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"x-Q. 24. To whom did you explain the process as carried out by you in 1897?

"A. I explained the process to one R. E. Hamilton.

"x-Q. 25. Did you tell him that the matrix was made by applying a conducting coating to a wax record and electroplating thereon?

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"A. I do not remember telling him that in detail, it being sufficient to tell him of it, as he was more or less familiar with electrical operations.

"x-Q. 26. Did he see you carrying out the process at that time?

"A. He did; he saw me in the act of carrying it out.

"x-Q. 27. With a thick ring?

"A. Yes, sir.

\* \* \* \* \*

167

"x-Q. 33. Between 1897, when you showed the process to Mr. Hamilton, and the summer of 1899, when you succeeded in interesting the Messrs. Philpot in the process, did you explain the process to any person?

"A. I do not think I did.

168

"x-Q. 34. My understanding of the situation is that, so far as Mr. Taylor is concerned, you never explained to him the carrying on of the process, using cylinders sufficiently thick to maintain their shape during and after the act of disengagement from the matrix, and that it was not until the early fall of 1897 that you explained such a process to Mr. Hamilton, and that from the fall of 1897 until the summer of 1899 you did not explain the process to any one; have I correctly stated the facts?

"A. I did not, nor would not have explained the process in detail to anyone, except Mr. Hamilton. So far as Mr. Taylor is concerned, your statement is correct.

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process, did you explain  
on?  
di?  
standing of the situa-  
r. Taylor is concerned,  
him the carrying on of  
ders sufficiently thick to  
ring and after the act of  
e natrix, and that it was  
1897 that you explained  
r. Hamilton, and that  
til the summer of 1899  
he process to any one;  
the facts?  
ould not have explained  
to anyone, except Mr.  
r. Taylor is concerned,  
et.

\* \* \*

" Re-d. Q. 12. What was your reason for not explaining the process from the early fall of 1897 to the summer of 1899?

" A. I did not care to trust others with it.

" Re-d. Q. 13. Did you think you had your invention reduced to practice during this last-named period?

" A. I did.

" Re-d. Q. 14. During this period under consideration, were you making any attempt to get others interested in it for the purpose of promoting your inventions?

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" A. I did not try to get others interested in the invention for the process; what I did try to get others interested in was in using the phonograms formed by the process, in connection with advertising novelties.

Re-d. Q. 15. Why did you not explain the process to the people that you tried to interest in the advertising process?

171

" A. I did not think it necessary to explain the process; and, moreover, would not have done so.

" Re-d. Q. 16. Did you show these people any records made by your process?

" A. None of them were sufficiently interested in my proposition to bring it to that point.

" Re-d. Q. 17. In other words they turned down your proposition; is that correct?

172

" A. It is."

Witness R. E. Hamilton (referred to in Q. 26 and x-Q. 24), who is the only corroborating witness in support of Lambert's testimony with respect to his alleged reduction to practice in the fall of 1897, testifies as follows:

" Q. 3. How long have you known Mr. Lambert?

" About fifteen years.

\* \* \* \* \*



173

" Q. 6. Did you ever see him make any records, and if so, when and where ?

" A. Yes ; I have ; in September or October of 1897, at 67 Lake street, Chicago.

" Q. 7. What kind of a record was it he produced there which you saw ?

174

" A. The one that I saw him produce was a circular record made of a hard substance like celluloid ; and he showed me at the same time other records of similar material, which I did not see him produce, but which he stated he had made.

" Q. 8. Were these records thin, so that they would collapse easily in the hand, or were they thick enough to be self-sustaining ?

" A. They were of varying thicknesses ; some of them were thin, and his aim seem to be to obtain material by which he could make them thick enough not to collapse.

175

" Q. 9. I now hand you a record marked ' Exhibit Lambert's 1897 Matrix,' and ask you if you have ever seen anything like it ?

" A. Yes, sir. I cannot tell whether it is the identical record, but it looks like one I saw Mr. Lambert make at 69 Lake street along sometime in the fall of 1897."

176

This question 9 is vague. It is not absolutely clear whether Hamilton was referring to the exhibit matrix or the exhibit record. It is the record which is essential. The matrix was undoubtedly made in 1897. Substantially the same matrix was made before that date by others. The question is, was the phonogram made of a thin strip of proper thickness, or of sufficient thickness to maintain its shape throughout its manufacture ?

In answer to question 10, Hamilton goes on to describe what he saw. He is very explicit and clear as to his recollection of the method of making the matrix, a non-essential thing as far as it relates to the real in-

see him make any record where?

in September or October at Chicago.

if a record was it he produced?

saw him produce was a hard substance like I saw at the same time the material, which I did at which he stated he had

records thin, so that they were in the hand, or were they sustaining?

varying thicknesses; some of his aim seem to be to show he could make them collapse.

you a record marked 'Ex-Matrix,' and ask you if it was like it?

not tell whether it is the same as the one I saw Mr. Hamilton make street along sometime

It is not absolutely referring to the exhibit. It is the record which is undoubtedly made in the matrix was made before the question is, was the phonograph proper thickness, or of a certain shape throughout

Hamilton goes on to describe very explicit and clear as to the method of making the matrix, and it relates to the real in-

vention of the issue, but he is not so clear when he comes to the description of the essential thing, the method of making the reproduced record.

Hamilton further testifies:

" Q. 13. Did you have any talk with Mr. Lambert prior to the fall of 1897?

" A. Yes, sir.

" Q. 14. About how long prior to 1897 was this talk? 178

" A. I will have to make a guess as to that; I should say two or perhaps three years prior to that.

" Q. 15. Did he explain his process comprehensively to you at this early date?

" A. No, sir; he did not.

\* \* \* \* \*

" x-Q. 1. You say, Mr. Hamilton, in describing the process which Mr. Lambert carried out in your presence in the fall of 1897, that he took a sheet or strip of celluloid and made a ring out of it; what was the thickness of this sheet? 179

" A. I do not know what the thickness was—they were very thin; about like a sheet of paper; perhaps a little heavier.

" x-Q. 2. After the impression was made on this ring of sheet celluloid was the celluloid mounted on a backing?

" A. Yes, sir.

\* \* \* \* \*

" Re-d. Q. 1. Do you mean by your last two answers to state that the celluloid ring which you saw formed, or was explained to you by this process, was so thin that it would not stand up?

" A. It is really impossible for me to tell you as to whether he formed the impression on the ring and then backed it up or backed it up first.

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178

179

180



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" Re-d. Q. 2. The records you saw produced, however, were self-sustainable, were they not ?

" A. Yes, sir.

" Re-d. Q. 3. The record which I have shown you as an exhibit in the case is similar to or possibly one of those which you saw at that date ?

" A. Yes, sir."

182

It is thus seen that the thickness of the sheet which was used was "about like a sheet of paper." This description does not correspond to the phonogram exhibit 1897.

183

To state that the record produced is "self-sustainable" does not necessarily mean that the material used during the manufacture is "sufficiently thick to maintain its shape during and after the act of disengagement from the matrix" as called for in the issue. A record made from a thin sheet of celluloid so thin as to collapse after removal from the matrix, mounted upon a backing, could be described as a "self-sustainable record."

In answer to Re-d. Q. 1 Hamilton says :

" It is really impossible for me to tell you as to whether he formed the impression on the thin ring and then backed it up or backed it up first."

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Lambert has not proven a reduction to practice of the invention defined in the issue of September, 1897, nor at any time previous to his date of filing his allowable application.

The only testimony as to the production of successful records is the statement by Lambert in answer to x-Q. 1, page 52, Lambert's testimony in rebuttal :

" x-Q. 1. How long have you been making the celluloid records you refer to—I mean the 75,000 you claim to have made and sold ?

records you saw produced,  
tainable, were they not?

record which I have shown  
the case is similar to or  
which you saw at that

thickness of the sheet which  
a sheet of paper." This  
pool to the phonogram

produced is "self-sustain-  
mean that the material used  
sufficiently thick to main-  
ter the act of disengage-  
all for in the issue. A  
sheet of celluloid so thin as  
from the matrix, mounted  
scribed as a "self-sustain-

Hamilton says:

for me to tell you as  
the impression on the  
ked it up or backed it up

reduction to practice of  
ssue of September, 1897,  
his date of filing his allow-

he production of success-  
by Lambert in answer to  
estimony in rebuttal:

have you been making  
you refer to—I mean the  
ave made and sold?

47 "A. Since some time in the summer of 1900. We began  
to put them on the market then."

This was after the patent was granted.

It is well stated by the Examiners-in-Chief:

"We cannot regard a process which has not been executed  
to make the product which his patent calls for, as reduced  
to practice."

Lambert not having proven a reduction to practice, prior  
to his date of filing, namely, August 14, 1899, it follows that  
he must stand on said date, being his date of constructive re-  
duction to practice. Having so held, Edison's case is in no  
way affected, whether Edison is or is not entitled to a date  
of reduction to practice (which, however, he has been given  
by the Examiner of Interferences and the Examiners-in-  
Chief), any earlier than his date of filing his allowable appli-  
cation, namely, March 5, 1898, seventeen months prior to  
Lambert's date of filing.

Priority of invention is awarded to Edison.

The decision of the Examiners-in-Chief is affirmed.

E. B. MOORE,  
*Assistant Commissioner.*

December 10, 1901.





## CIRCUIT COURT OF THE UNITED STATES,

NORTHERN DISTRICT OF ILLINOIS,

NORTHERN DIVISION.

NATIONAL PHONOGRAPH COMPANY,  
Complainant,

vs.

LAMBERT COMPANY,  
Defendant.

In Equity.

No. 26,598.

Patent No. 713,209.

*To the Honorable the Judges of the Circuit Court of the  
United States in and for the Northern District of Illi-  
nois, in Chancery Sitting:*

The answer of the Lambert Company, defendant, to  
the bill of complaint of the National Phonograph Com-  
pany, complainant.

This respondent, now and at all times hereafter saving  
to itself all and all manner of benefit and advantage of  
exception which can or may be had or taken to the mani-  
fold errors, uncertainties, imperfections and insufficien-  
cies in said bill of complaint contained, for answer there-  
to, or unto so much or such parts thereof as it is advised  
it is material or necessary for it to make answer unto,  
answering says:

I. This respondent denies each and every allegation  
in said bill of complaint contained, except as hereinafter  
admitted, or specifically answered or avoided.



II. This respondent admits that it is a corporation duly organized under the laws of the State of Illinois, and a citizen of said State, and an inhabitant of the Northern Division of the Northern District thereof, as alleged in said bill of complaint.

III. This respondent has no knowledge, information or belief as to whether the complainant, National Phonograph Company, is a corporation duly organized and established by law and a citizen of said State of New Jersey, save from the allegation in that regard contained in said bill of complaint, and does not admit that the said complainant is a corporation organized or operating as alleged. And this respondent denies that said complainant is a corporation having any power, organization, or authority to own, hold or operate under any letters patent, or any invention or inventions covered by letters patent, or to bring suit or suits thereunder; and therefore prays that said complainant may be required to make strict proof thereof in this cause.

IV. This respondent admits, upon information and belief alone, that certain letters patent of the United States No. 713,209 were issued to Thomas A. Edison the 11th day of November, 1902, for alleged new and useful Improvements in Processes for Duplicating Phonograms, as alleged in said bill of complaint; but it does not admit that said letters patent are good and valid in law, or that the said Thomas A. Edison was the original, first and sole inventor of the pretended inventions or improvements described and claimed therein; or that the said pretended inventions or improvements were the product of the inventive faculty or contained any patentable novelty whatever; or that the said pretended inventions or improvements were not on sale or in public use

for more than two years in this country prior to the application for said letters patent No. 713,209; or that the said pretended inventions or improvements were not known or used before the alleged invention or discovery thereof by the said Thomas A. Edison; or that the said alleged inventions or improvements were not patented or described in any patent or printed publication in the United States before the invention or discovery thereof by the said Thomas A. Edison, or more than two years prior to his application for said letters patent; or that the said Thomas A. Edison, or his legal representatives or assigns had not made any application for foreign patent or patents more than seven months prior to the application for said letters patent No. 713,209 in the United States of America; or that the said complainant has invested and expended large sums of money and has been to great trouble in and about the said invention for the purpose of introducing the same and making it profitable to the public; or that the validity of said letters patent has ever been affirmed by any court having jurisdiction in patent matters, as alleged in said bill of complaint; and this respondent calls upon the complainant for strict proof as to such matters and each and every of them.

V. This respondent admits that prior to the granting of said letters patent No. 713,209 to the said Thomas A. Edison, to wit, on the 16th day of May, 1900, interference proceedings were instituted by the Commissioner of Patents between the application for said patent, and letters patent of Thomas B. Lambert No. 645,920, dated March 20, 1900, for the purpose of determining the question of priority of invention of the subject-matter covered by claim 17 of the said Edison patent No. 713,209 and claim 1 of the said Lambert patent No. 645,920; and



that, after various interlocutory questions and hearings on the matter before the Board of Examiners-in-Chief and Commissioner of Patents, decisions were rendered granting priority of invention to the said Thomas A. Edison; but this respondent denies that there was any interference in fact between said Edison application and the Lambert patent, and avers that, if there was any interference in fact between said application and patent, the said Edison was guilty of wilful negligence in postponing his disclosure of the said invention to the public until after others had acquired rights which it is now unjust and inequitable to destroy—as by reference to the files of said interference or duly authenticated copies thereof here in court to be produced, if required, will more fully appear.

VI. This respondent avers that it has no knowledge, save from said bill of complaint, that before the signing of this bill, or at any time, the said Thomas A. Edison, by an instrument in writing, signed by him and duly executed and delivered, sold, assigned, transferred and set over unto the said complainant, the National Phonograph Company, the full and exclusive right, title and interest in and to said letters patent No. 713,209, and in and to the invention described and claimed therein, together with any and all rights of action, claims and demands whatsoever of the said Edison, either at law or in equity, for damages or profits, or both, arising from past infringement of said letters patent, with the full right to the said complainant in his own name to sue upon and collect the same for its own use and behoof; and that the said complainant has ever since been and is now possessed of the same; and this respondent calls upon the complainant for strict proof as to such matters and each and every of them.

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Examiners-in-Chief  
sions were rendered  
he said Thomas A.  
that there was any  
lison application and  
t, if there was any  
plication and patent,  
l negligence in post-  
vention to the public  
hts which it is now  
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authenticated copies  
ed, if required, will

t has no knowledge,  
at before the signing  
Thomas A. Edison,  
by him and duly exe-  
transferred and set  
National Phonograph  
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209, and in and to  
herein, together  
ains and demands  
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rising from past in-  
with the full right to  
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VII. This respondent denies that it has ever in any way made, used, or caused to be made, phonograms by the employment of the said improved process of duplicating phonograms, containing and embodying the invention set forth in letters patent No. 713,209; or that it used, or caused to be used, the said invention in the manufacture of its phonograms, or still continues so to do; or that it has threatened or is threatening to continue the alleged unlawful acts set forth in said bill of complaint in defiance of the rights secured to the said complainant; but, on the contrary, this respondent avers and insists that all of its operations with regard to the manufacture of its phonograms have been conducted in good faith and as a matter of right, and not in violation or infringement of any right of the said complainant, or otherwise, and calls upon the said complainant for strict proof as to these matters and each and every of them.

VIII. This respondent admits that it is engaged in a corporate capacity only in the manufacture, sale and use of celluloid phonograms; that it has in good faith manufactured such phonograms and placed them upon the market and that such articles have met with great favor at the hands of the public and have proved very successful; and it charges that it is by reason of this fact and in pursuance of a scheme on the part of the complainant to appropriate the business and good-will of this respondent that the said bill of complaint has been brought.

IX. This respondent denies that the said Thomas A. Edison made application in accordance with the then existing laws of Congress to the proper department of the United States for letters patent; or that the said patentee complied with the conditions and requirements of said law; or that the said letters patent were signed,



sealed, executed and issued in due form of law; and it therefore leaves the complainant to make such proof thereof as it may deem advisable.

X. This respondent avers that the subject-matter contained in the claims of said letters patent No. 713,209, issued to the said Thomas A. Edison November 11, 1902, is different from and is not for the same invention originally filed in the application for said letters patent, and alleges that no supplemental oath, as required by law, was filed in support of the amendments by which such claims were introduced; wherefore this respondent submits that said claims as issued are void and of no effect, inasmuch as the claims as issued were drawn to cover and include devices which had come into existence between the date of the filing of such application and the date of said letters patent.

XI. This respondent, further answering on information and belief, says:

1. That the alleged invention or discovery described and claimed in said letters patent No. 713,209 was and is not an invention or discovery, or the proper subject-matter of letters patent of the United States, and that the same was and is the result of mere mechanical skill.

2. This respondent avers, on information and belief, that the alleged invention described and claimed in said letters patent No. 713,209 is not and never has been of any practical utility or value whatever; and it also further denies that the process described in said letters patent will produce the effect or accomplish the result described in said letters patent, or is or would be a practical process for the uses and purposes indicated.

3. That the said patentee, Thomas A. Edison, constructively abandoned the invention described and claimed

in said letters patent No. 713,209 by not applying for a patent thereon for more than two years after it was in public use in this country.

4. That, for the purpose of deceiving the public, the description and specification filed by the patentee in the Patent Office contained less than the whole truth relative to his invention or discovery, or more than is necessary to produce the desired effect; and that the description of the invention in the specification is not in such full, clear, concise and exact terms as to enable any persons skilled in the art to which it appertains to make, construct, compound and use the same.

5. This respondent further avers and states that the claims as issued in said letters patent No. 713,209 are not distinct, in that they do not particularly point out and distinctly claim the part, improvement, or combination which the said alleged inventor claims as his invention or discovery.

6. This respondent further avers and states that said letters patent No. 713,209 were surreptitiously obtained for the alleged invention described and claimed, which invention or inventions was or were in fact invented by others, who were using reasonable diligence in adopting and perfecting the same, because of which said letters patent are therefore void and of no effect.

XII. This respondent denies, on information and belief, that the said Thomas A. Edison was the original and first inventor or discoverer of the alleged inventions or improvements described and claimed in said letters patent No. 713,209; but, on the contrary, it avers and insists that the said alleged invention and improvements were in public use long prior to the pretended invention or discovery thereof by the said Thomas A. Edison, and particu-



larly that the same were known and used at the following named places and by the following named persons, to-wit:

George H. Herringdon, at Wichita, Kansas, and elsewhere—present residence, Wichita, Kansas.

Edward H. Johnson, at New York, N. Y., and elsewhere—present residence, New York, N. Y.

William B. Carpenter, at Newark, N. J., and elsewhere—present residence, Newark, N. J.

Celluloid Novelty Company, at New York, N. Y., and elsewhere—present residence, New York, N. Y.

Celluloid Manufacturing Company, at New York, N. Y., and elsewhere—present residence, New York, N. Y.

Horace K. Petit, at Fishkill-on-the-Hudson, N. Y., and elsewhere—present residence, Fishkill-on-the-Hudson.

Thomas A. Edison, at Llewellyn Park, N. J., and elsewhere—present residence, Llewellyn Park, N. J.

Emil Berliner, at Washington, D. C., and elsewhere—present residence, Washington, D. C.

Eldridge R. Johnson, at Philadelphia, Pa., and elsewhere—present residence, Philadelphia, Pa.

Thomas B. Lambert, at Chicago, Illinois, and elsewhere—present residence, Chicago, Illinois.

H. G. Wolcott, at Fishkill-on-the-Hudson, N. Y., and elsewhere—present residence, Fishkill-on-the-Hudson, N. Y.

XIII. This respondent denies, on information and belief, that the said Thomas A. Edison was the original, first and sole inventor or discoverer of the alleged inventions and improvements described and claimed in said letters patent No. 713,209; but, on the contrary, avers and insists that the said alleged invention and improvements were described and claimed in various patents and publications long prior to the pretended invention thereof by

the said Thomas A. Edison, and particularly in the following named patents and publications, to-wit:

- N. A. Douner, No. 91,100, June 8, 1869;
- C. S. Brooks, No. 187,095, February 6, 1877;
- W. B. Carpenter, No. 237,168, February 1, 1881;
- J. W. Hyatt, No. 239,791, April 5, 1881;
- M. C. Lefferts, No. 281,529, July 7, 1883;
- T. A. Edison, No. 382,419, May 8, 1888;
- G. H. Herrington, No. 397,856, February 12, 1889;
- T. A. Edison, No. 406,571, July 9, 1889;
- W. W. Jacques, No. 413,382, October 22, 1889;
- G. H. Stevens, No. 650,431, May 29, 1900;
- H. G. Wolcott, No. 650,739, May 29, 1900;
- A. N. Petit, No. 657,956, September 18, 1900;
- I. W. Heysinger, No. 460,338, September 29, 1901;
- T. A. Edison, No. 526,147, September 18, 1894;
- H. J. Lioret, No. 528,273, October 30, 1894;
- F. T. Burgis, No. 537,003, April 9, 1895;
- E. Berliner, No. 548,623, October 29, 1895.

BRITISH LETTERS PATENT.

Jonathan Lewis Young, No. 1,478, of January 23, 1894; and

German Patent, No. 108,308.

XIV. This respondent, further answering, upon information and belief, avers that the alleged invention described and claimed in said letters patent No. 713,209 was in public use and on sale by others, and at places other than those before cited, prior to the alleged invention or discovery of the same by the said Thomas A. Edison and prior to the filing of the original application for said letters patent; that it has been diligent in its efforts to ascertain their names and residences, and where used when



patented; and it therefore prays leave of this Honorable Court on obtaining such information to file its amended answer herein setting forth the same.

XV. This respondent, further answering, on information and belief, denies that the complainant herein would have been in undisputed possession or enjoyment of any valuable or exclusive privilege secured by said letters patent and in the receipt of profits therefrom, except for the acts of these defendants; but, on the contrary, avers that others have manufactured phonograph records in a similar manner openly and without any restriction being placed thereon in any way whatever; and it therefore leaves the said complainant to make such proof thereof as it may deem necessary.

XVI. This respondent, further answering, denies that the complainant has sustained any loss, injury or damage by reason of any wrongful or unlawful acts or doings of this respondent, or that the said complainant is entitled to any damages, profits or gains as in said bill alleged, or to an accounting for profits against this respondent; and it also denies that the said complainant will be subjected to great and irreparable damage or injury unless this court should grant the relief herein prayed for, or that the said complainant will suffer any damage by reason of the acts of this respondent; as well as further denying that this complainant has any right to an injunction, provisional or perpetual, against this respondent, or to any other right or relief whatever, as prayed for in said bill of complaint.

Without this, that any other matter, cause or thing in said bill of complaint contained, material or necessary for this respondent to make answer unto, and not herein and hereby well and sufficiently answered unto, confessed and

Answer.

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11 avoided, traversed or denied, is true; all of which matters and things this respondent is ready and willing to aver, maintain and prove, as this Honorable Court shall direct, and prays to be hence dismissed with its reasonable costs and charges in this behalf most wrongfully sustained.

And this respondent will ever pray, etc.

LAMBERT COMPANY,  
By ALBERT D. PHILPOT,  
*Secretary.*

(Corporate Seal.)  
THOMAS F. SHERIDAN,  
*Of Counsel.*

State of Illinois, }  
County of Cook, } ss.

On this 28th day of February, A. D., 1903, before me, a notary public within and for the County and State aforesaid, personally appeared Albert D. Philpot, personally known to me, and made oath that he is the secretary of the above named defendant; that he has read the foregoing answer and knows the contents thereof; and that the same is true of his own knowledge, except as to those matters therein stated on information and belief, and as to these he believes it to be true.

(Notarial Seal.)

ANNIE C. COURTENAY,  
*Notary Public for Cook County.*



UNITED STATES CIRCUIT COURT,  
Northern District of Illinois—  
Northern Division.

National Ponograph Company, Complainant,	} In Equity No. 26,598.
vs.	
Lambert Company, Defendant.	

Notice is hereby given that I shall proceed to take proofs for final hearing on the part of the complainant under the 67th Rule of the Supreme Court, for Courts of Equity, as amended, or in accordance with the statute in such case made and provided, and in pursuance of the rules and practice of this Court, before Marshall P. Sampsell, Esq., Examiner, specially appointed by the Court, at our office No. 718 The Temple, Chicago, Illinois, on Wednesday, the 1st day of July, 1903, at 2 o'clock in the afternoon.

You are hereby invited to attend and cross-examine any witnesses produced.

The examination will be adjourned from day to day and to such time and place as may be required, without further notice.

Dated Chicago, Ill., June 27th, 1903.

ISHAM, LINCOLN & BEALE,  
*Solicitors for Complainant.*

To Thomas Francis Sheridan, Esq.,  
Solicitor for Defendant,  
Chicago, Illinois.

Service acknowledged this 27th day of June, 1903.

THOMAS F. SHERIDAN,  
*Solicitor for Defendant.*

**Complainant's Testimony for Final  
Hearing.**

UNITED STATES CIRCUIT COURT,

NORTHERN DISTRICT OF ILLINOIS,

NORTHERN DIVISION.

NATIONAL PHONOGRAPH COMPANY,  
Complainant,

vs.

LAMBERT COMPANY,  
Defendant.

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In Equity,  
No. 26,598.

Testimony for final hearing on behalf of complainant  
taken under the 67th Rule as amended before MARSHALL  
E. SAMPSELL, Special Examiner, by consent.

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CHICAGO, July 1, 1903.

Met pursuant to notice.

Present:—

RICHARD N. DYER, Esq., for complainant.

THOMAS F. SHERIDAN, Esq., for defendant.

**Albert D. Philpot.**

ALBERT D. PHILPOT, a witness subpoenaed on behalf  
of the complainant, being duly sworn, deposes and  
says, as follows:

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DIRECT EXAMINATION BY MR. DYER:

Q. 1. What is your name, age, residence and occupa-  
tion?

A. Albert D. Philpot, Chicago, Illinois, Secretary of  
the Lambert Company, age is forty-six.

Q. 2. Are you acquainted with the process employed  
by the Lambert Company for making phonograph



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records between November 11, 1902, and January 5 1903 ?

A. Yes.

Q. 3. Please describe that process.

A. First we take a celluloid tube and place it inside of a matrix; second, we apply live steam to the interior of the blank for the sole purpose of rendering the blank plastic; third, when the blank has been made plastic, we use cold air under pressure to gently  
198 force the blank into contact with the matrix; the cold air cools the celluloid phonogram; when it is cold, it is collapsed sufficiently to enable us to force it out of the matrix; we use material thin enough so that it can be pressed inwardly with the fingers if necessary.

Q. 4. Please state how the matrix which you employed during that time was made or how the matrixes were made.

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MR. SHERIDAN: Question objected to as intimating that the matrixes were made during that time without there being any foundation previously laid for such question or assumption.

A. We render a wax blank—a wax record electrolytically conductive by coating it with graphite; we then use the ordinary electrotyper's bath.

Q. 5. Is that part of the process correctly described by the following language: "Forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive and electrolytically depositing metal thereon forming a matrix ?"  
200

A. The process of making the matrix is substantially correct; I object to the expression of "forming a record on a cylinder of wax;" we take a wax record that has already been made, with that correction it would be right.

Q. 6. That is, you take the wax or waxlike cylinders with the sound record already made upon them which you are able to buy upon the market ?

A. We use the records that we have made for us.

Q. 7. Well, those are made by forming a record on a cylinder of wax or other relatively soft material.

A. Those are made by engraving the sound waves on the wax surface.

Q. 8. Of a cylinder?

A. Of a cylinder.

Q. 9. Now, after the metal coating has been formed electrolytically on the wax cylinder what do you next do to form the matrix?

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A. The matrix has been formed when that operation has been completed.

Q. 10. Don't you back up the electrolytic deposit and don't you melt out the original wax cylinder?

A. We do not have to melt out the original wax cylinder as it will shrink out when taken out of the bath.

Q. 11. What do you do to increase the thickness of the metal which forms the matrix?

A. We back up the matrix with plaster of paris inside of an iron ring.

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Q. 12. So that the result is a matrix in the form of a cylinder having the phonograph record in relief on its inner wall?

A. That's right.

Q. 13. Now, your next step is to insert a tube of celluloid into the matrix; how close a fit does the tube make in the matrix?

A. The next step is to insert a celluloid tube in the matrix; the variation in size of the matrix and of the celluloid tube varies with nearly every matrix.

204

Q. 14. How close a fit does the tube make in the matrix?

A. From a sixteenth to a thirty-second of an inch probably, clearance all around.

Q. 15. Under what pressure is the live steam which is then admitted to the interior of the celluloid tube?

A. The pressure is about thirty pounds pressure, per square inch.



205

Q. 16. Isn't this pressure sufficient to force the celluloid tube outwardly against the matrix and cause it to receive an impression of the record?

A. I wouldn't be able to answer that question positively, but my judgment would be that it would not.

Q. 17. How long is the live steam pressure maintained in the celluloid tube?

A. About twenty seconds.

206 Q. 18. What pressure do you use with the cold air that you subsequently admit to the interior of the celluloid tube?

A. We admit the air under a pressure of not less than 100 pounds to the square inch.

Q. 19. Have you ever cooled off the celluloid tube and removed it from the matrix after applying the steam pressure and without applying the subsequent pressure?

207 MR. SHERIDAN: Objected to unless the date is fixed to the question.

A. I haven't tried any such experiment during the past year that I can recall.

Q. 20. Your idea is then that the steam softens the celluloid but that thirty pounds per square inch is not sufficient pressure to force the softened tube outwardly against the matrix, so as to take an impression?

A. I am of the opinion that a good commercial record could not be made that way.

208 Q. 21. The effect of the air pressure is then to expand the cylinder outwardly so as to take the impression from the matrix?

A. That is my idea of it.

Q. 22. How thick is the celluloid tube that you used between November 11, 1902, and January 5, 1903?

A. It is approximately 40-1000ths of an inch.

Q. 23. A celluloid tube of this thickness is thick enough to maintain its shape?

A. It is thick enough to maintain its shape.

Q. 24. Now, after the impression is made the cellu-

loid tube shrinks as it cools down so as to shrink away from the surface of the matrix sufficiently to allow the tube to be removed by pulling it longitudinally out of the matrix?

A. The celluloid tube collapses sufficiently under the cold air to allow it to be pushed out of the matrix longitudinally.

Q. 25. And the tube is then removed in that way from the matrix—by pushing it out longitudinally?

A. That's the way it is removed.

210

Q. 26. Is it not a fact that the process used by the Lambert Company between November 11, 1902, and January 5, 1903, is correctly described by the following statement, considering the work of making the original record, which you say is done for you, as a part of the method: "The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive and electrolytically depositing metal thereon, forming a matrix, and then outwardly expanding under pressure within the matrix, a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix and finally removing the cylinder or tube by direct longitudinal movement?"

211

A. It is not correctly described that way.

Q. 27. In what respect?

A. You haven't admitted the cold air under pressure nor upon the material which is plastic and requires the cold air pressure.

212

Q. 28. Is not the effect of admitting the cold air under pressure to outwardly expand the celluloid tube in the matrix?

A. The cold air will certainly expand the celluloid tube in the matrix, but you didn't describe that process in your original question.

Q. 29. In my question I did not attempt to state how each step of the method was performed, but



213

only to state the effect of each step of the method ; with that explanation I wish to repeat Q. 26 ?

A. The process as described by you in Q. 26 does not make a Lambert celluloid record.

Q. 30. For the reason stated in your answer to Q. 27 ?

214

MR. SHERIDAN : The question is objected to for the reason of asking the witness for conclusions of law, and this objection is also made to Q. 26.

A. That is one of the reasons.

215

Q. 31. I will repeat Q. 26 and will include the feature of admitting the cold air under pressure. Is it not a fact that the process used by the Lambert Company between November 11, 1902, and January 5, 1903, is correctly described in general terms without embracing all the details by the following statement, considering the work of making the original record, which you say was done for you, as a part of the method :

216

" The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conducive and electrolytically depositing metal thereon, forming a matrix and then outwardly expanding under pressure within the matrix (by means of cold air under pressure) a cylinder or tube of softened material (previously softened by admitting live steam) sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement " ?

MR. SHERIDAN : The question is objected to, as complainant's witness has already answered fully and completely, and the question is considerably different from previous Q. 26, and different from the language used by the witness as to the word softened, and attempting to put

ach step of the method ;  
 repeat Q. 26 ?  
 ed by you in Q. 26 does  
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 002, and January 5, 1903,  
 eral terms without em-  
 following statement, con-  
 he original record, which  
 a part of the method :  
 cord cylinders for phono-  
 forming a record on a  
 atively soft material, ren-  
 wax cylinder electrically  
 depositing metal thereon,  
 outwardly expanding under  
 y means of cold air under  
 f softened material (pre-  
 g live steam) sufficiently  
 during and after the act  
 trix, and finally removing  
 longitudinal movement " ?

question is objected to, as  
 has already answered  
 and the question is con-  
 m previous Q. 26, and  
 age used by the witness  
 , and attempting to put

in the witness' mouth the language of the  
 previous Lambert patent.

A. It would not make a Lambert celluloid record ;  
 under our present process.

Q. 32. What is your criticism of the statement con-  
 tained in the last question ?

A. The present material used by the Lambert Com-  
 pany, being only 40/1000ths of an inch in thickness,  
 will not maintain its shape under steam pressure un- 218  
 less the Lambert expander is introduced.

Q. 33. You mean the cold air under pressure by a  
 " Lambert expander " ?

A. No. I mean the " Lambert expander," the pro-  
 cess described in the patent of William Messer now  
 owned by the Lambert Company.

Q. 34. What is that ? I thought you had already  
 described all the details of your process.

A. The Messer patent consists in a machine for  
 holding the matrix and a top plate which holds in 219  
 position the plastic celluloid tube.

Q. 35. Do you now mark your records with the mark  
 " Patented March 20, 1900 " ?

A. We do not.

Q. 36. When did you stop using that mark ?

A. I couldn't tell exactly the date, but it was some  
 months ago.

Q. 37. You continued to use it down to some time  
 during the present year, didn't you ?

A. Why, my recollection is that we used some of 220  
 the top plates with the old mark on during the present  
 year.

Q. 38. So that the celluloid records made when you  
 used that plate bore the imprint " Patented March 20,  
 1900 " ?

A. We were not informed of the necessity of chang-  
 ing the date on the top plate and made up a number  
 of top plates with the wrong patent date, these plates  
 were used by mistake for some little time, but were



221

plates made under the Messer patent with the wrong patent mark on them.

Q. 39. And the celluloid records which you made as late as January of the present year, which you say had the wrong patent mark on them, bore the imprint "Patented March 20, 1900"?

A. All the records made by mistake bore the patent mark "March 20, 1900."

222

Q. 40. How late did you continue to make records bearing that patent mark of March 20, 1900?

MR. SHERIDAN: The question is objected to as immaterial and irrelevant.

A. My recollection is that it was some time during the holidays—Christmas, New Year holidays, 1902–1903.

223

Q. 41. Please state the name and addresses of the men in the employ of the Lambert Company who know what method the Lambert Company used in making its records between November 11, 1902, and January 5, 1903?

A. Bryan F. Philpot, 26 Euston St., London, William F. Messer, same address, London, and A. D. Philpot, Chicago.

Q. 42. Have you no workman in your employ now who were with you at that time in your factory?

224

A. I do not allow the workmen in the factory to understand the process under which we make our records.

Q. 43. Please give the names of the workmen in the factory who were there at that time.

A. I do not know their names or addresses.

MR. SHERIDAN: The entire deposition is objected to on account of being taken out of the time set down in Rule 67 as amended and cross-examination is made by Mr. Sheridan, counsel for defendant, subject to this objection.

MR. DYER: Complainant's counsel states that

replication was not filed until April 6, 1903, and consequently the three month's time in which to take testimony has not yet expired.

CROSS-EXAMINATION BY MR. SHERIDAN :

x-Q. 44. Do you ever take—or have you ever taken any old records back in exchange for new records?

A. A great many thousand.

x-Q. 45. Do you know as a matter of fact whether you made any matrixes at all between November 11 and January 5th of the present year? 226

A. I would not be able to state on personal knowledge.

x-Q. 46. These matrixes last a long time and can be used over and over again, can they not?

A. They last indefinitely and can be used a great many times.

x-Q. 47. And do you know definitely whether you used one of these old matrixes or whether you used new ones between November 11, 1902, and January 5, 1903, do you? 227

A. I wouldn't know personally.

x-Q. 48. In other words, you don't remember, is that true?

A. That is right.

x-Q. 49. Could you use heat alone to expand a celluloid phonogram and mold a sound record thereon the matrix?

A. We could not. 228

x-Q. 50. Your celluloid blank when you place it in the matrix is a very thin hollow cylinder, is it not?

A. It is.

x-Q. 51. You render it plastic by the application of a gentle heat such as live steam, do you not?

A. We do.

x-Q. 52. And it is pressed outwardly and evenly up to and against the face of the electro matrix by the use of cold air under pressure, is it not?

A. It is.



229

x-Q. 53. The thin cylinder tube is rendered plastic by the use of steam, is it not?

A. It is.

x-Q. 54. I would ask you if in removing this cool cylinder you do not frequently, if not entirely, have to collapse or bend the tube slightly to force it out of the matrix?

A. That is part of the process.

230 x-Q. 55. What you considered as new in this process for the purpose of getting a patent on it was the use of cold air to both expand, cool and slightly shrink the celluloid phonogram, isn't that true?

A. That is correct.

x-Q. 56. Could you or could you not take a wax cylinder and reproduce a sound wave thereon by this process?

A. It would be utterly impossible.

231 x-Q. 57. In Q. 23 Mr. Dyer asked you as follows: "A celluloid tube of this thickness is thick enough to maintain its shape?" You answered, "It is thick enough to maintain its shape."

A. I wish to add to that it is thick enough to maintain its shape after it has been manufactured.

x-Q. 58. Is it thick enough to maintain its shape during and after the act of disengagement from the matrix? In other words, will the cylinder remain a perfect tube while it is being removed from the matrix, or does it collapse or bend slightly while you are removing it from the matrix?

232 A. The celluloid tube would not maintain its shape during the process of manufacture unless the Messer top plate were used during the process.

x-Q. 59. I am talking about the step of the process which is described as "the disengaging action;" does the thin cylindrical phonogram maintain its shape during the act of disengagement, or does it bend or collapse slightly inwardly during the act of disengagement; which of these steps is true?

A. It is collapsed slightly during the act of disengagement.

233

x-Q. 60. You speak of its being "thick enough to maintain its shape" after it has been disengaged; has the thickness anything at all to do with this maintaining of its shape, or has the form of the phonogram at each end the effect of maintaining the phonogram shape after disengaging?

A. It is the forming of the end that allows the phonogram to maintain its shape and not the thickness of the material.

234

MR. DYER: Complainant's counsel objects to the questions on cross-examination as leading, and it is agreed that this objection shall be considered as having been taken in time after each question.

#### RE-DIRECT EXAMINATION BY MR. DYER:

Re-d. Q. 61. In making the Lambert record, as you made it between the dates referred to, after the celluloid tube was expanded outwardly against the matrix, what produced the contraction which disengaged it from the matrix? 235

A. My theory would be in answer to that question that the natural tendency of the material itself to get back to its original size.

Re-d. Q. 62. As a matter of fact it does contract sufficiently to disengage the outer surface of the celluloid tube from the wall of the matrix?

A. It disengages sufficiently with a pressure and a slight collapsing to allow us to remove it from the matrix. 236

Re-d. Q. 63. Didn't it disengage sufficiently in some or most cases so that it could be pushed out of the matrix without collapsing?

A. We find in most of these cases that we do not have a full print on our record.

Re-d. Q. 64. With that qualification you answer the last question in the affirmative?



237

A. We have to discard records that come out in the way described by Mr. Dyer.

Re-d. Q. 65. Have you any objection to allowing counsel to see that process carried on in your factory?

A. I would be very pleased to take counsel to the factory at any time and allow him to see the process.

Re-d. Q. 66. Can I see the process carried on to-morrow morning, or any time to-morrow at your factory?

238

A. The factory is shut down at present for repairs and enlargement, it will be opened about the 10th day of July, and we will be pleased to show your expert the process that we carry on at or after that time.

It is stipulated that complainant's time for taking its *prima facie* testimony for final hearing may be extended up to and including the October rule day.

239

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241

## UNITED STATES CIRCUIT COURT,

NORTHERN DISTRICT OF ILLINOIS—NORTHERN DIVISION.

NATIONAL PHONOGRAPH COMPANY,  
Complainant,

vs.

LAMBERT COMPANY,  
Defendant.

In Equity.  
No. 26,598.

242

Please take notice that we shall continue with the taking of proofs for final hearing on the part of complainant, under the 67th Rule of the Supreme Court for courts in equity as amended or in accordance with the statute in such case made and provided, and in pursuance of the rules and practice of this Court, before MARSHALL E. SAMPSELL, Esq., Special Examiner 243 by consent, at our office, No. 718 The Temple, Chicago, Illinois, on Friday, the 6th of November, 1903, at eleven o'clock in the forenoon. You are hereby invited to attend and cross-examine any witnesses produced. The examination will be adjourned from day to day and unto such time and place as may be required without further notice.

Dated Chicago, Illinois, November 1st, 1903.

ISHAM, LINCOLN & BEALE,

Solicitors for Complainant. 244

To THOMAS F. SHERIDAN, Esq.,

Solicitor for Defendant, Chicago, Illinois.

Received a copy of the above notice this 2nd day of November, 1903.

THOMAS F. SHERIDAN,  
Solicitor for Defendant.



245

UNITED STATES CIRCUIT COURT  
FOR THE NORTHERN DISTRICT OF ILLINOIS,  
NORTHERN DIVISION,

246

NATIONAL PHONOGRAPH COMPANY,  
Complainant,  
vs.  
LAMBERT COMPANY,  
Defendant,

In Equity.  
No. 26,598.

CHICAGO, Nov. 6, 1903.

Met pursuant to notice.

Present—Counsel as before.

247

**Alfred C. Rustad.**

ALFRED C. RUSTAD, a witness produced by complainant, being duly sworn, deposes and says

DIRECT EXAMINATION BY MR. DYER :

Q. 1. What is your name, age, residence and occupation.

248 A. Alfred C. Rustad, residence 698 North Campbell Avenue, Chicago, 26 years of age, machinist.

Q. 2. Were you ever employed by the Lambert Company.

A. Yes, sir.

Q. 3. For how long?

A. As near as I remember about three years and a half.

Q. 4. When did you leave that company?

A. On July 18, 1903.

Q. 5. What was your position when employed by that company?

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No. 26,598.

CHICAGO, Nov. 6, 1903.

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A. When last there I held position as foreman at the  
factory.

Q. 6. For how long was that ?

A. Well I was foreman there, had been in charge  
of the factory after Mr. B. F. Philpot left for England.

Q. 7. When did he leave for England about ?

A. I think he left out sometime in July, 1902.

Q. 8. What was your position with the Lambert  
Company before Mr. Philpot left for England ?A. Well I held position as foreman part of the time  
before that, but did not have full charge. 250Q. 9. Are you acquainted with the process employed  
by the Lambert Company for making Phonograph  
records as the work was done in the factory between  
November 11, 1902 and January 5, 1903 ?Defendant's counsel objects to the question,  
as assuming conclusions which are not shown  
by the witnesses' previous testimony.

251

A. Well in making the records, yes, I understood the  
business.

Q. 10. Please describe that process ?

A. The material is brought to the factory in tube  
form, and the material is stretched over a steam-heated  
mandrel so as to form it in a—as near perfect a cylin-  
drical shape. After the tubes have been stretched they  
are cut in a lathe in smaller lengths, their perfect  
length for forming. After they have been cut up both  
ends of the cylinder are turned or formed in a hot plate.  
After they have been formed on both ends they are  
put on a machine and the outside surface of them cleaned  
and after they have been thoroughly cleaned they are  
coated in a solution of acetone and fauchine. Then the  
blanks are allowed to cure before taking to the printing  
room. The blanks are then taken to the printer and are  
placed in a mold or matrix and put in a machine called  
a printing machine ; that is, one blank is placed in a  
matrix or mold and a certain amount of steam is  
applied to it. When it has been in the steam the

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length of time required, the steam is turned off and cold air is turned inside of the mold in place of the steam.

Q. 11. What is then done after the cold air is turned on?

Defendant's counsel objects to the question as leading.

254

A. Well, the air is left inside of the mold for a certain length of time and then taken out; that is, the matrix and record are taken from the machine after the air has been turned off. Then the printer takes another matrix and places a blank in it or celluloid tube and places it in the machine and the same operation is performed to it as the first one.

Q. 12. During the time that the printer is effecting a printing operation with the second matrix, what, if anything, is done with the matrix you first described

255 with the material therein?

Defendant's counsel objects to the question again as leading, and begs to call the attention of the Court to this style of questioning the witness in contradiction to the form of Q. 10.

A. The first matrix is set to one side and allowed to cool, and while the second matrix is in the machine the printer is getting his blank and matrix ready to be  
256 put in the machine when the next matrix is taken out, and so on it continues.

Q. 13. What is the effect of allowing the matrix to cool?

Defendant's counsel objects to the question : first, as grossly leading; second, as an attempt to coach the witness; and finally asks to call the attention of the Court again to this form of questioning in contradistinction to a general form, as exemplified by counsel's question 10.

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counsel's question 10.

257

A. After the matrix has stood a length of time that record must be removed from the mold and matrix and another blank placed in its place, and as that mold stood and cooled the record has shrunk sufficiently to be removed from the matrix or mold. That is why that matrix was set to one side and allowed to be cold.

Q. 14. As the process was carried on between the dates I have given, how long a time was the matrix allowed to cool after being taken out of the printing machine, and before the record was removed from it? 258

A. I should judge about a half an hour.

Q. 15. After this cooling had taken place, how was the record removed from the matrix?

Defendant's counsel objects to the question as leading, and again begs to call the attention of the Court to this style of questioning of this particular witness.

259

A. The record being sufficiently shrunk from the matrix, it would drop out of itself if the matrix was held in the air in such a position to allow the record to drop from the mold or matrix into the hand.

Q. 16. In carrying on this process, as a commercial operation, was any other way employed for getting the record out of the matrix than that you have described of shrinking the record?

A. Well, the matrix might be set on the bench and the record could be removed by lifting it up.

260

Q. 17. Was any other way used commercially for freeing or loosening the record from the matrix than the cooling and shrinking operation which you have described?

A. Not commercially. After the record was printed and set to cool in the mold, it should have shrunk sufficiently to be removed, as stated before.

Q. 18. You have spoken of forming the ends of the blanks in a hot plate; what did that operation do?

A. The blank was placed in a brass tube, the bottom plate of the machine being heated; the blanks were set



261

in the machine and the plate brought down on the top of the blank, pushing the blank down into the groove in the bottom plate, which is shaped as the blank is when it is pulled down into the machine. When that first turn is made the blank is taken out and put in another machine as this turn is not sufficient, a plug is put on the inside of the blank and the blank is pulled down with this plug on the inside of it, forming that end of the record over at nearly a right angle; then the blank is taken out and the other end is turned the same as the first end was before it went into the second machine.

262

Q. 19. What change in the shape of the blank is produced by these operations?

A. One end is turned over, almost at a right angle and the other not as far.

Q. 20. What was the material used for the blanks?

A. Well, it was called celluloid as far as I know.

Q. 21. You have spoken of printing the blank, what do you mean by that?

263

A. The blank or celluloid tube is placed in a matrix or mold and this mold is then placed in a machine, the mold and blank setting on a bottom plate of the machine, and then another top plate is brought down on top of the blank and locked there; then a certain amount of steam is applied to the blank, and when the steam has sufficiently softened the material, there is cold air turned on in place of the steam which has a tendency to expand and firmly bring this celluloid tube against the matrix taking the impression from the mold.

264

Q. 22. I show you a copy of patent No. 705,772 granted Jan. 29, 1902, on invention of William F. Messer; please look at the drawing of the patent and state whether you know the machine which is shown by that drawing?

Defendant's counsel objects to this question as incompetent, in view of the fact that the witness is not qualified as to the reading of or the understanding of letters patent or parts thereof.

265

A. As near as I can see this is the machine that was being used at the time I was employed by the company.

Q. 23. What was this machine called?

A. Well, we called them expanding machines and printing machines.

Q. 24. Was this the machine you referred to before as the printing machine?

A. Yes, sir, this is the machine that I referred to before as the printing machine.

Q. 25. I show you a cylindrical object with a pink outer surface and a white inside; what is that, if you know? 266

A. That is a phonograph record.

Q. 25½. Is it similar to or different from the records made by the Lambert Company, by the process you have described, between November 11, 1902, and January 5, 1903.

A. It looks just exactly like the phonograph records that were made as I describe.

267

Complainant's counsel offers in evidence patent No. 705,772 shown the witness and the same is marked "Complainant's Exhibit Messer Patent No. 705,772."

Also the phonograph record shown the witness, and the same is marked "Complainant's Exhibit Lambert Co. Phonograph Record No. 1."

Q. 26. At the time you left the Lambert Company was the factory running? 268

A. Yes, sir.

Q. 27. Are you acquainted with Mr. Albert D. Philpot the secretary of the Lambert Company?

A. Yes, sir.

Q. 28. At the time you left the company did Mr. A. D. Philpot have anything to do with the factory?

A. Yes, sir.

Q. 29. What?

A. I think he had charge of the business end of it.



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Q. 30. How frequently did he visit the factory about that time?

A. He would visit the factory very nearly once a day.

Q. 31. Did you have any conversation with Mr. Philpot shortly before you left the company about an expected visit of a representative of the Edison Company to investigate the process of manufacture?

A. Yes, sir.

270

Q. 32. Please state what that conversation was—what Mr. Philpot said and what you said?

A. Well, Mr. Philpot told me that he expected an expert from the Edison Phonograph Company to visit our factory to see and learn how the Lambert Company's record was manufactured.

Defendant's counsel states that complainant's counsel asked the witness as follows: "Q. Is that all? A. Yes, that's all."

271

Complainant's counsel states that not knowing whether the witness had completed his answer to the question, complainant's counsel inquired of the witness if he had finished his answer, and the witness gave an affirmative reply. The language used is correctly stated by defendant's counsel, but the question was not intended as a question for the record, but was the usual inquiry which counsel make in these cases without it appearing on the record.

272

Q. 33. Was that all Mr. Philpot said about the matter.

Defendant's counsel objects to this line of questioning as being immaterial and irrelevant, unless some foundation for its introduction is forthcoming.

A. That was all at that time. He told me that this expert was to come to the factory on the tenth of July

273

but, as the factory was not in operation between July 3d and 13th of 1903 we could not show the expert the manufacturing of the record. Then when the factory started up, on I think, Monday, July 13th of 1903, Mr. Philpot then told me that the Edison's expert would be there on the following Thursday—I have made a mistake and wish to correct myself. It was on Thursday, I think the 23rd of July, that the expert was to come, but as I left on July 18th, I am not positive of that—or rather don't know if the expert called at the Lambert Company's factory. 274

Q. 34. At the time of this second talk with Mr. Philpot, did he explain to you what he expected to show the Edison expert, and if so what did he say and what did you say?

Defendant's counsel does not like to place himself so many times before the Court in the light of an objector, but he respectfully calls the attention of the Court to the form of the last question and the evident intent to extract something further out of the witness. 275

A Well, he told me that—or rather asked me—to take and do the printing on the day that the Edison expert was to visit the factory and I told him that I would put some of the—or rather one of the other printers as they would understand the printing as well as I did, but he insisted that I should go back there and print records and show that the phonograph record made by the Lambert Company would not shrink from the mold, and, as I refused to do this, things were made very disagreeable for me in the future; so I resigned my position on July 18th. 276

CROSS-EXAMINATION BY MR. SHERIDAN:

x-Q. 35. Where were you born, Mr. Rustad?

A. Chicago, Illinois.

x-Q. 36. Where did you learn the machinists' trade?



277

A. I started to work for the Hooker Steam Pump Company.

x-Q. 37. When did you start to work for them?

A. I think it was in 1892; I am not sure. I don't remember that part of it now.

x-Q. 38. How long did you work for them?

A. I probably worked there a little over three years, I guess.

278 x-Q. 39. For whom did you work just preceding your employment by the Lambert Company?

A. Well, if I remember right, I believe I came back from Rochester, New York. I was working for the Standard Bottle & Glass Company at that time.

x-Q. 40. How long were you with the Standard Bottle & Glass Company?

A. I believe I was in Rochester about nine months. I must have been in the employ of the Standard Bottle & Glass Company, I think, about six or seven months.

279 x-Q. 41. Did you work for anybody else in Rochester besides this company?

A. No, sir.

x-Q. 42. Between the time that you went to work for the Hooker Steam Pump Company and the Lambert Company, how many places did you work at, roughly speaking?

A. Well, I probably worked at three different places.

x-Q. 43. Is that including the Standard Bottle & Glass Co. or not?

280 A. No, sir.

x-Q. 44. Did you always give satisfaction wherever you worked? Outside of the Lambert Company?

A. I think that I gave satisfaction both at the Lambert Company and the other places that I worked.

x-Q. 45. In answer to question 34 you stated that Mr. Philpot—in substance—asked you to do the printing on the day that the Edison expert was to visit the factory, in a certain way, and it was because of this and your refusal to comply with the request, and the disagreeable consequences of your refusal that you

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resigned your position? Was that the only cause of your resignation?

A. Yes, sir.

x-Q. 46. You are quite positive of this, are you?

A. Well, I am positive, as I said before, that things were made very disagreeable for me—he complained about my work not being turned out fast enough and one thing and another, and I know that I done the best that I could and always worked for the interest of the Lambert Company and got their work out as fast as possible, and don't think that Mr. Philpot had any reason to complain about the work being behind on the day that I left. 282

x-Q. 47. Was this the first time that Mr. Philpot complained of your work?

A. Well, it wasn't the first time on the day that I left.

x-Q. 48. How long previous to your leaving did he first complain to you about work being unsatisfactory?

A. Well, it was very shortly before I quit that I noticed I wasn't satisfactory to Mr. Philpot. 283

x-Q. 49. By shortly do you mean one week, two weeks, three weeks or how many weeks?

A. Well, I don't just remember. It might have been a couple of weeks before I left there.

x-Q. 50. As a matter of fact, don't you know that a large number of records had been returned from customers that were spoiled by you or employees in your charge during the printing process, long before any conversation which you said took place in answer to question 34? 284

A. Yes, sir, I am aware of the fact that records were returned at the time I had charge of the factory, but previous to the time that I left the Lambert Company I asked Mr. Philpot on Saturday afternoon if he was dissatisfied with my work and told him that I was doing the best that I could, and he said that it was no fault of mine; that under the conditions that the printing had been done that he couldn't blame me for it.

x-Q. 51. Didn't he also tell you during some of these



285

conversations that unless the loss of material was stopped, there would be a change in the force at the factory?

286

A. Yes, sir, he told me that and between, or rather after we had changed the steam run on the printing machine and made a slight change in making the printing machines more perfect so as to do more accurate work, the Lambert Company turned out a better record to my estimation when I left their employ than they ever did before.

x-Q. 52. When did this change in the "Steam running" take place?

A. Well, I think those changes were made at the time the factory was shut down.

x-Q. 53. Did Mr. Philpot ever complain to you about the number of relatives and friends you had employed under you?

A. No, sir, not while I was employed by the Lambert Company.

287

x-Q. 54. Did you have any of your relatives or friends under you while you were employed by the Lambert Company?

A. Why, there was a brother-in-law of mine working for the Lambert Company.

x-Q. 55. What was his name?

288

A. His name was Joseph Bloom, but he was not a brother-in-law of mine at the time he was hired to work at the Lambert Company. As Mr. B. F. Philpot asked me if I would get Mr. Bloom back again. He had been employed there once before, and Mr. Philpot asked me if I could get him a good man, so I told him of Mr. Bloom, and he said that I should tell Mr. Bloom to come down; so it was practically Mr. B. F. Philpot that hired Mr. Bloom.

x-Q. 56. You say you resigned from the employment of the Lambert Company on Saturday, July 18th. Is it not also true that you took all or substantially all of your employees with you or got them to leave with you at the same time?

A. I think it is true that most of the employees left



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on the same Saturday that I did, but that I told them  
to leave is not true.

x-Q. 57. Have you ever tried to re-enter the em-  
ployment of the Lambert Company since your resigna-  
tion?

A. I called at the office of the Lambert Company  
to see Mr. Philpot in regard to a recommendation,  
and at the same time asked him what my chances were  
back with the company, and he told me that there had  
been an entire different change at the factory, and that  
he didn't know what kind of a position there would  
be for me, as Mr. Tyler had charge there, and I would  
have to work under him if I went back, and I didn't  
agree to that. 290

x-Q. 58. As a matter of fact didn't you threaten  
Mr. Philpot or some one else connected with the Lam-  
bert Company that you would make them trouble if  
they didn't take you back, or words to that effect?

A. No, sir.

x-Q. 59. Didn't you show Mr. Philpot a letter from  
the Edison Company or Chicago branch or the Na-  
tional Phonograph or its Chicago branch in reply to a  
letter which you had written them? 291

A. Yes, sir.

x-Q. 60. And during the time or shortly after you  
showed this didn't you state in substance that if they  
took you back you wouldn't give them any testimony  
or help them in any way?

A. No, sir.

x-Q. 61. You are quite positive as to the correct-  
ness of your answer to the last two questions, are you? 292

A. Yes, sir.

x-Q. 62. Are you being paid to testify in this case, if  
so, how much are you to receive or receive?

A. I was told that if I would testify and tell the  
truth what I knew about manufacturing records and  
testify, that I would be paid for my time and expenses  
that I was away from my work.

x-Q. 63. Did you have charge of the matrix making  
department in the Lambert factory?



293

A. No, sir.

x-Q. 64. How did you come to testify in this suit?

A. I wrote the Edison Company and told them that I had been employed by the Lambert Company and told them when I wrote that I had left them recently, and asked them for a position in their factory.

x-Q. 65. Did you ask anything about testifying for them in litigation in your letter to them?

294 A. No, sir, I only wrote them one letter asked them for a position, and that is all.

RE-DIRECT EXAMINATION BY MR. DYER :

Re-d. Q. 66. How many employees were there employed by the Lambert Company during the latter part of your employment?

A. Well, if I remember rightly there was in the neighborhood of a dozen—twelve.

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RE-CROSS EXAMINATION :

Re-x-Q. 67. Before testifying in this case, did you have any interviews or an interview with the counsel for complainant in this suit or his expert or any body connected with complainants in this suit in regard to the character or subject matter of your deposition, or what it was to be?

296 A. I received a card asking to meet Mr. Dyer Thursday evening and I did so, and he asked me if I was willing to give my testimony if I was called upon, and I told him that I would, because I might just as well come willingly as be subpoenaed to court, and told him that I would testify regardless in whose favor the testimony might be; that I would take the stand and tell nothing but the truth.

Re-x-Q. 68. I am asking you if you told him the nature of what you were going to testify to?

A. I said that Mr. Dyer merely asked me if I would testify in this case, and I told him that I would and that I would say nothing until the time that my tes-

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timony was to be taken and that I would get up and  
 tell nothing but the truth.

Re-x-Q. 69. Do you mean to say that you had no  
 conversation with anybody connected with the com-  
 plainants in this cause directly or indirectly, as to what  
 the nature of your deposition would be?

A. I have said that there was nothing said in re-  
 gards to my testimony only that I should tell the  
 truth and tell what I knew when I got on the stand in  
 telling of the manufacture of the Lambert Company's  
 records. 298

Re-x-Q. 70. Surely you can answer my question yes  
 or no, and I will ask the stenographer to read it.

(Question read.)

A. I answer "no" to that question.

Re-x-Q. 71. Did you tell anybody directly or in-  
 directly connected with complainants in this cause  
 prior to your giving your present deposition about  
 your conversation with Mr. Philpot in regard to the  
 visit of the Edison expert to the factory of the Lam-  
 bert Company? 299

A. I was asked by Mr. Dyer if I had charge of the  
 Lambert Company's factories when their expert visited  
 the same, and told him no.

Re-x-Q. 72. Then you did have a conversation differ-  
 ing from what you answered to my questions Re-x-Q.  
 67, 68 and 69, didn't you? 300

A. Your question said—or rather asked if I had told  
 Mr. Dyer my opinion and what I was going to testify.  
 Wasn't that the question?

Re-x-Q. 73. Perhaps we can get at it this way. Did  
 Mr. Dyer or any body else connected with the com-  
 plainant in this cause, ask you anything in regard to  
 the nature of the process that you practiced for the  
 Lambert Company, prior to your going on the stand  
 this morning?

A. He simply asked me how long I was employed



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by the Lambert Company and if I understood the manufacturing of the record from start to finish.

Re-x-Q. 74. And that was all the conversations you had with Mr. Dyer or anybody else connected with the complainants in this cause prior to your giving testimony in this suit?

302

A. That is all that I recollect of outside of a personal conversation regardless of the suit with the Lambert Company, only that I asked him if he thought that I could get a position with the Edison Company, and he answered that he did not know and could not say anything definite.

ALFRED C. RUSTAD.

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**Joseph Bloom.**

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JOSEPH BLOOM, a witness, being produced by the complainant, being duly sworn, deposes and says as follows:

DIRECT EXAMINATION BY MR. DYER:

Q. 1. What is your name, residence and occupation?

A. My name is Joseph Bloom; residence, 721 North Artesian avenue, Chicago. I am a stenographer and musician at the present time.

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Q. 2. Did you ever work for the Lambert Company?

A. Yes, sir.

Q. 3. For what length of time?

A. For about two years.

Q. 4. When did you leave the employ of the Lambert Company?

A. July 18, 1903.

Q. 5. What was your work while in the employ of that company?

A. Well, I did pretty nearly everything, and when I left I was printing.

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FRED C. RUSTAD.

Q. 6. How long had you been working on the print-  
ing before you left?

A. Well, I couldn't say exactly. Mr. Rustad used to  
take me off and put me on different jobs—that is, oc-  
casionally.

Q. 7. Did you do printing at different times through-  
out your period of employment, or only at the end of  
your employment?

A. No, throughout all the time.

Q. 8. In printing these records as the thing was  
done commercially at the Lambert factory, how was  
the record removed from the matrix?

A. Well, by the time that we would go to take one  
matrix or mold to print a new record out of this matrix  
or mold the record would be shrunk sufficient to fall  
out of this matrix or mold.

Q. 9. Please state just what was done with the  
matrix and the record after the matrix was taken out  
of the printing machine with the record inside of it?

A. Well, we would take the matrix and the record  
and lay it aside. We usually had three or four and  
sometimes five in front of each machine—and by the  
time we would get back to the same matrix or mold,  
that is the one we started with, the record would be  
cold. Then we would hold the matrix up and let the  
record slide out easily.

Q. 10. Was this way of getting the record out of the  
mold, that is, by allowing it to cool and shrink out,  
the way which was used all the time during your em-  
ployment at the factory?

Defendant's counsel objects to the form of  
these questions together with question 8. The  
question is directly leading, second, it is in-  
tended to coach the witness.

A. Well that is the way I always took them out.  
We could take the matrix and lay it down on the table  
and pull the record up out of the matrix but that was  
liable to scratch the matrix.



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Q. 11. Were the records ever taken out before they were cooled, so as to shrink away from the matrix in the regular manufacturing operation?

Defendant's counsel objects to the question as leading.

A. No, sir; they were always cooled before taking them out.

310 Q. 12. Is the way of taking the records out of the matrix which you have described that which was employed at the factory of the Lambert Company between November 11, 1902, and January 5, 1903?

Defendant's counsel again calls attention of the Court to this form of the leading question and objects to the same.

A. Yes, sir.

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CROSS-EXAMINATION BY MR. SHERIDAN:

x-Q. 13. Is Mr. A. C. Rustad your brother-in law?

A. Yes, sir.

x-Q. 14. I believe you left the employ of the Lambert Company the same time that your brother-in-law did, did you not?

A. Yes, sir.

312 x-Q. 14. Did you have any grievance against the Lambert Company at the time that you left their employ?

A. No, sir.

x-Q. 15. Who spoke to you first about testifying in this suit?

A. Mr. Rustad.

x-Q. 16. You say you did printing of the records at different times, did you not?

A. Yes, sir.

x-Q. 17. And that the records always dropped out?

A. Mostly.

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x-Q. 18. And if they didn't drop out how did they  
get out of the matrixes?

A. Sometimes my helper would miss some of the  
printing machines which would burn the record, then  
we would have to put them in cold water so as to  
shrink them out.

x-Q. 19. Didn't you ever have to force them out by  
hand?

A. No, we could do it if we wanted to, that is liable  
to scratch the matrix.

x-Q. 20. Did you have any talk with Mr. Rustad or  
anyone else prior to your taking the stand this after-  
noon, in regard to what you would testify to?

A. Mr. Rustad told me that he saw Mr. Dyer and he  
gave—Mr. Rustad gave—Mr. Dyer my name and that  
probably I would be called upon to testify.

x-Q. 21. I am asking you if you talked with them or  
anyone else as to what you would testify?

A. No, sir.

Jos. BLOOM. 315

Adjourned to November 7, 1903, at 10 A. M.

CHICAGO, November 7, 1903.

Met pursuant to adjournment.

Present:

MR. RICHARD N. DYER, for complainant;

MR. HARRY I. CROMER, for defendant.

### Thomas J. Staley, Jr.

THOMAS J. STALEY, JR., a witness produced by com-  
plainant, being duly sworn, deposes and says:

DIRECT EXAMINATION BY MR. DYER:

Q. 1. What is your name, age, residence and occu-  
pation?

A. Thomas Jefferson Staley, Jr. My age is 24 last



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October; my residence is 339 La Salle Avenue, Chicago. I am cashier and bookkeeper for the Lambert Company.

Q. 2. Were you subpoenaed to appear here as a witness?

A. Yes, sir.

Q. 3. How long have you been cashier and bookkeeper for the Lambert Company?

318 A. I guess about a year and a half; something like that.

Q. 4. Do the names of the employees appear upon the books?

A. No, sir.

Q. 5. How do you make up your pay-roll?

A. There is a time book sent over from the factory by the foreman with the names of the employees on and the amounts due.

Q. 6. And what does your pay-roll consist of as you make it up?

319 A. Well, how do I understand your question?

Q. 7. I assume when this book is received you make up some sort of a list with the amounts. If that is not the method, please explain what you do?

A. I take the gross amount off the time book and I make a voucher for it on the stubs of the check book.

Q. 8. Do you make out pay envelopes with the names on them?

A. Yes, sir.

320 Q. 9. How many factory employees are there at the present time?

Objected to as immaterial, irrelevant and incompetent.

A. I could not answer that; they vary.

Q. 10. About how many were there, as shown by the pay envelopes last week?

Objected to upon the same grounds as the last objection.

A. Probably about 15.

Q. 11. Has that been about the number since you have been cashier and bookkeeper for the Lambert Company?

Same objection as above.

A. About the average number.

Q. 12. How many classes of help are represented by these factory employees? 322

A. I don't understand what you mean by classes.

Q. 13. Does the time book or your pay envelopes indicate anything with respect to the grades of the employees?

A. No; with the exception of the matrix department which is a different department account from the factory pay roll.

Q. 14. How many employees are carried on the matrix pay roll? 323

Objected to as incompetent, irrelevant and immaterial.

A. One.

Q. 15. Has that been the number since your employment?

A. No, sir.

Q. 17. About what has been the average number of employees on that account? 324

This entire line of examination with reference to the number of employees now employed or at any time employed by the Lambert Company is objected to as incompetent, irrelevant and immaterial, and as being plainly an effort on the part of counsel for complainant to bring to the attention of the court matters pertaining to the affairs of the company which clearly have no bearing whatever upon the merits of the case, and it is agreed by counsel for complainant that



325

this objection shall apply to all future questions concerning this subject.

A. Two.

Q. 18. Who is the factory foreman at the present time?

That is objected to as incompetent, irrelevant and immaterial.

326

A. W. S. Tyler.

Q. 19. How long has he been employed by the company in any capacity?

A. Almost two years, I think; I would not be positive about it.

Q. 20. How long has he been foreman?

A. Since about the middle of July—it is the latter part of July, I think. It is July 18th, I am almost sure.

Q. 21. He has been foreman since about July 18th of the present year?

A. Yes, sir.

Q. 22. Who preceded Tyler as foreman?

A. Rustad.

Q. 23. Do you have a class of employees in the factory known as printers?

A. Well, I don't know—the work changes about considerable, and there is no one person that probably does that work all the time, that I know of.

Q. 24. Have you any memorandum at the office of the company giving the residences of any of the factory employees?

A. No, sir.

Q. 25. I suppose you know Mr. Tyler's residence, do you not?

A. No, sir.

CROSS-EXAMINATION BY MR. CROMER:

x-Q. 26. In answer to question 4 you stated in effect that the names of the employees do not appear

329

upon the books. Did you refer to the books that you have charge of and knowledge of only when giving that answer ?

A. I referred to my ledger. That is all the book that I have.

x-Q. 27. Are there any addresses of any of the employees on any of the books of the company so far as you know ?

A. No, sir.

330

#### RE-DIRECT EXAMINATION :

Re-d-Q. 28. What was Tyler's employment before he became foreman ?

A. He was at the head of the matrix department.

The witness having read over his deposition wishes to make a correction.

(Witness :) In answer to x-Q. 26 I refer to the books that I have charge of. That is all. " Yes, sir " would have been all right to x-Q. 26.

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#### RE-CROSS EXAMINATION :

Re-x-Q. 30. In your answer to x-Q. 26 you state that you referred to your ledger and also stated that that is the only book that you have. I understand that you desire to correct this answer. Is it true or not that the ledger is the only book that you have ?

332

A. No, sir.

Re-x-Q. 31. What part of the answer was incorrect then ?

A. The clause I referred to my ledger was incorrect.

Re-x-Q. 32. Kindly give what you now understand answer to cross question 26.

A. Yes, sir.



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## RE-DIRECT EXAMINATION :

Re-d. Q. 33. You have knowledge of the factory books which have the names of the employees. Have you not?

That is objected to as inferring that the names of employees appear upon the factory books.

334

A. Yes, sir.

## RE-CROSS-EXAMINATION :

Re-x-Q. 34. Have any of the factory books the names of the employees therein to your knowledge?

A. Why the time book has the names of the employees in.

Re-x-Q. 35. Do you have anything to do with the time book which you refer to?

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A. Nothing beyond making up the pay roll from it.

## RE-DIRECT EXAMINATION :

Re-d. Q. 36. Do you have any account on your office books with any employee of the factory?

A. With one.

Re-d. Q. 37. Which one?

A. The foreman.

Re-d. Q. 38. Your office books do then show the  
336 name of the foreman?

A. Yes, sir.

Re-d. Q. 39. And has that been so since you kept the books and if not so for how long?

A. Yes, sir, ever since I have been there.

T. J. STALEY, JR.

**Thomas B. Lambert.**

THOMAS B. LAMBERT, a witness subpoenaed for complainant, being duly sworn, deposes and says:

DIRECT EXAMINATION BY MR. DYER:

Q. 1. What is your name, age, residence and occupation? 338

A. Thomas B. Lambert; 37 years; 183 Belden avenue, Chicago, Illinois; manufacturing toys.

Q. 2. Were you ever connected with the Lambert Company, and, if so, in what capacity?

A. Yes, sir; I was connected with them from the time of their organization until about the first of May, 1902, in various capacities connected with the manufacture of phonograph records.

Q. 3. Did the company receive its name from you?

A. The company was named without my knowledge or consent, when I held no interest in the company whatever. 339

Q. 4. Upon whose invention was the business of the company started?

A. Upon mine.

Q. 5. You are the Thomas B. Lambert named as inventor in patent 645,920, granted March 20, 1900?

A. Yes, sir; I am.

Q. 6. I show you patents granted upon inventions of Thomas B. Lambert, dated October 27, 1903, and numbered respectively 742,454 and 742,455. Do these patents describe any apparatus or process which was used in the manufacture of phonograph records by the Lambert Company during your connection with that company? 340

These questions are all objected to and particularly all questions with relation to the processes employed upon the ground that anything done by the Lambert Company prior to November



341

11, 1902, the date of the patent sued upon, is incompetent, immaterial and irrelevant.

A. Patent No. 742,454 describes a process and patent No. 742,455 describes an apparatus which were in use by the Lambert Company prior to May, 1902.

Q. 7. Did you develop the process of manufacturing phonograph records which was used by the Lambert Company during your connection with that company?

342

A. Yes, sir; I did.

Q. 8. In the two patents which you have just referred to, the following statement appears: "The cooling of the record cylinder also shrinks it, so that it can be easily removed from engagement with the matrix." Was the operation so referred to in these patents a part of the manufacturing process of the Lambert Company during the time of your connection with it?

343

Objected to upon the same grounds set forth in the last objection and upon the further grounds that the witness has not been properly qualified as an expert.

A. Yes, sir; it was.

Q. 9. Please explain how the part of the process which related to the removal of the phonograph record from the matrix was carried on in regular manufacture?

344 A. When the pressure was taken off the interior of the record the matrix with the enclosed record was removed from the machine and allowed to cool, and when cooled sufficiently the record was removed from the matrix.

Q. 10. What was the effect of the cooling?

A. The record would shrink more than the matrix so that it could be taken out. In some cases they were even dipped into cold water to accomplish this chilling and consequent shrinking.

Q. 11. How were the records taken out of the molds after shrinkage?

tent sued upon, is irrelevant.

a process and patents which were in or to May, 1902. The process of manufacturing was used by the Lambert with that company?

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the cooling? more than the matrix. In some cases they were to accomplish this taken out of the molds

A. They generally fell out when the mold was lifted, although occasionally they would adhere to the inside of the matrix, so as to make it necessary for them to be pushed out.

Q. 12. Do you mean that occasionally they would fail to shrink away so as to remain tight in the mold or that they would shrink away all except at some point where the record would stick to the mold?

A. When the record would fail to be easily removed from the matrix, it was generally due to a sticking of some special parts. The shrinkage was sufficient to allow its removal, unless there was some apparent chemical action between the celluloid record and the material of the matrix. This sometimes took place to such an extent that the record was removed with difficulty, but in general the shrinkage due to the cooling was sufficient. 346

Q. 13. In the cases you have referred to where due to some apparent chemical action the shrinkage was not sufficient to allow the removal of the cylinder easily, was the record produced a perfect record? 347

A. In general, yes. Occasionally the record would be destroyed in the operation, but this was very seldom.

Q. 14. In the occasional cases where the record was difficult of removal from the matrix was there any shrinkage of the record at all?

A. Yes, sir. But in this case it would shrink away from one side, or in various spots. For instance it might shrink away from two opposite sides while the celluloid record adhered strongly to the matrix surface between these points. In that case the record was not absolutely cylindrical. 348

Q. 15. Was it possible to remove these records from the matrixes before any shrinkage took place?

A. Not and have them retain their shape?

Q. 16. How could that be done and not have them retain their shape?

A. I have seen them adhere to the matrix so strongly that it became necessary to put the entire matrix,



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record and all, into hot water and soften the celluloid so that it might be stripped from the matrix.

Q. 17. Would the record after removal in this way be a commercial record?

A. No, sir.

Q. 18. Did you ever try to take out these records such as were being commercially made by the Lambert Company during your connection with that company, by collapsing the record in the matrix before the shrinkage was sufficient to allow of the direct removal?

A. Yes, sir, I have.

Q. 19. With what result?

A. That was the way I took them out when they stuck so strongly to the matrix.

Q. 20. I mean without softening the celluloid and thereby destroying its form. In other words was it possible to collapse the Lambert record as regularly manufactured out of the molds instead of shrinking them out and retain the commercial character of the product.

A. Not with the use of material as thick as that in use at that time.

Q. 21. I show you complainant's exhibit "Lambert Co. Phonograph Record No. 1" which I understand is such a record as the Lambert Company manufactured between November 11, 1902, and January 5, 1903. Are you acquainted with this product?

A. Yes, sir; somewhat.

Q. 22. Is the material in that record of the same thickness as the material used in the records at the time of your connection with the Lambert Company?

A. No, sir; I think it is thinner.

Q. 23. Could such a record as this exhibit be collapsed out of the matrix before shrinkage and retain its commercial character?

A. I have never tried this myself, nor have I seen it done.

Q. 24. As one skilled in this particular art and having special experience in the making of these celluloid

353

records, is it your opinion that this could be done successfully and commercially?

The question is objected to as leading and suggestive of the answer desired.

A. It is not.

354

All of the questions and the answers thereto with relation to anything that occurred prior to November 11, 1902, the date of the patent sued upon, are objected to as incompetent, immaterial and irrelevant, and it is agreed by counsel for complainant that this objection shall apply to each of such questions and answers the same as if made at the time such questions were propounded or the answers made. The questions with relation to Exhibit No. 1 are also objected to upon the ground that the witness has not as yet been qualified to give testimony as an expert.

355

CROSS-EXAMINATION BY MR. CROMER :

x-Q. 25 In making the records which you assisted in the manufacture of, was the record complete when it had been expanded into complete contact with the matrix and allowed to cool sufficiently to maintain its shape?

A. No, sir, it was not. The ends were subsequently reamed to fit the mandrel of the phonograph.

356

x-Q. 26. With this exception would you not say that the records were complete at this time?

A. Yes, sir, I would.

x-Q. 27. Did you consider it desirable to bevel the matrix—in other words to make one end somewhat larger than the other so as to enable the records to be readily removed therefrom?

A. All the records that I ever made for this process were made in that manner, that is, with a very slight taper.

x-Q. 28. Does that in your opinion enable the records



357

to be removed after the pressure necessary to expand them has been removed and without any artificial means being employed to shrink the records, such records being allowed to cool naturally before such removal was attempted? In other words, would not the natural cooling of the record when a slightly bevelled matrix is used, enable the record to be removed?

A. The amount of bevel or taper would be very material in this case. A very slight bevel (say one  
358 degree) would probably have very little effect.

x-Q. 29. What effect would the natural cooling have? Would not the record shrink sufficiently as a result of the natural cooling to enable it to be withdrawn?

A. Yes, sir, I think it would.

RE-DIRECT EXAMINATION :

Re-d. Q. 30. What is the measure of the contraction which occurs in the manufacture of these Lambert  
359 records when the record has cooled down to normal atmospheric temperature. Please give this in thousandths of an inch, if you can. In other words, how much smaller than the bore of the matrix is the record itself after reaching normal atmospheric temperature?

A. About five thousandths of an inch.

Re-d. Q. 31. And what about is the maximum depth of the record groove on these record cylinders?

A. Probably one to two thousandths of an inch.

360

Complainant's counsel offers in evidence the three Lambert patents shown the witness Lambert and the same are marked "Complainant's Exhibit Lambert patent of March 20, 1900," "Complainant's Exhibit Lambert Patent 742,454" and "Complainant's Exhibit Lambert Patent 742,455," respectively; also a certified copy of the Edison patent No. 713,209 in suit and the same is marked "Complainant's Exhibit patent in suit"; also a certified copy of the Certificate of Incorporation of the National Phonograph Company and the same is marked



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"Complainant's Exhibit Complainant's Certificate of Incorporation"; also certified copy of assignment from Thomas A. Edison to National Phonograph Company dated December 16, 1902, and the same is marked "Complainant's exhibit assignment of patent in suit."

Objected to on behalf of defendant upon the ground that the exhibits offered are incompetent, immaterial and irrelevant to the issues herein.

362

Complainant's counsel gives notice that on Wednesday November 11, 1903, at the opening of the court on that day or as soon thereafter as counsel can be heard he will move the court for a preliminary injunction in accordance with the bill of complaint on Claim 17 of the patent in suit and for such other and further relief as to the Court shall seem meet.

He further gives notice that said motion will be based upon the pleadings in the cause, upon the depositions of Albert D. Philpot, Alfred C. Rustad, Joseph Bloom, Thomas J. Staley, Jr. and Thomas B. Lambert taken by complainant for final hearing; upon the exhibits referred to in said depositions; upon the proceedings on the former motion for preliminary injunction consisting of complainant's moving papers, filed January 7, 1903, the opinion of Judge KOHLSAAT of June 17, 1903, defendant's motion for rehearing, filed June 19, 1903, and the opinion of Judge KOHLSAAT upon the motion for re-hearing, filed July 29, 1903; also upon the affidavits of Henry C. Hecht, Jr., sworn to July 24, 1903, and Frank L. Dyer, sworn to July 27, 1903 and November 7, 1903, copies of which affidavits are now handed to defendant's counsel and upon the exhibits referred to in said affidavits which may be seen at any time by defendant's counsel at the office of complainant's solicitors.

363

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Adjourned to Monday, November 9, 1903, at 11 A. M.



365

UNITED STATES CIRCUIT COURT,  
NORTHERN DISTRICT OF ILLINOIS,  
NORTHERN DIVISION.

366

NATIONAL PHONOGRAPH CO.,  
Complainant,  
vs  
LAMBERT COMPANY,  
Defendant.

In Equity  
No. 26,598  
On Patent  
No. 713,209

**Notice.**

367 To THOMAS F. SHERIDAN, ESQ.,  
Marquette Building, Chicago, Illinois.  
Counsel for Defendant.

368 Notice is hereby given you that on Tuesday, the 17th day of November, 1903, at 10:30 o'clock in the forenoon of said day, at the law office of Richard N. Dyer, of Counsel for the Complainant herein, No. 31 Nassau Street, in the City and State of New York, before John Robert Taylor, a notary public in and for the County of New York in the State of New York, who is not of counsel or attorney to either of the parties hereto, nor interested in the event of this cause, we shall proceed to take the deposition, *de bene esse*, under and pursuant to the provisions of Sections 863, 864 and 865 of the Revised Statutes of the United States, of Frank L. Dyer, who lives at Montclair in the State of New Jersey, the same being a greater distance from the place of trial of this cause than one hundred miles, as a witness in behalf of the Complainant herein.

The taking of said deposition will be continued

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from day to day until completed, and at said time and place you may attend the said examination in behalf of the defendant, and cross-examine the said witness if you see fit.

Chicago, Nov. 11, 1903.

ISHAM, LINCOLN & BEALE,  
Solicitors for Complainant.

370

UNITED STATES OF AMERICA, }  
Northern District of Illinois, } ss.:  
STATE OF ILLINOIS, }  
County of Cook, }

WILLIAM B. DAVIES, being duly sworn, deposes and says that he is 24 years of age; that he is an attorney at law, residing in the city of Chicago, in the State of Illinois, and that he is employed in the law office of Dyrenforth, Dyrenforth & Lee, 1552 Monadnock Building, in said City of Chicago. 371

Affiant further says that on Wednesday, the 11th day of November, 1903, at 3:40 o'clock in the afternoon, he made service of the foregoing notice, by delivering a copy of the same into the hands of Thomas F. Sheridan, Esq., Solicitor for the defendant herein.

WILLIAM B. DAVIES.

Subscribed and sworn to before me this 11th day of November, 1903. }

372

M. S. MACKENZIE,

[SEAL.]

Notary Public.

IT COURT,  
F ILLINOIS,

ON.

In Equity  
No. 26,598  
On Patent  
No. 713,209

ago, Illinois.  
ndant.

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on will be continued



373

UNITED STATES CIRCUIT COURT,  
NORTHERN DISTRICT OF ILLINOIS,  
NORTHERN DIVISION.

374

NATIONAL PHONOGRAPH COMPANY,  
Complainant,

vs.

LAMBERT COMPANY,  
Defendant.

In Equity No.  
26598.  
On Patent No.  
713209.

Testimony taken on behalf of complainant pursuant to notice, before John Robert Taylor, Esq., a Notary Public and Special Examiner by consent, at 31 Nassau Street, New York City, New York, this 17th day of November 1903.

375

Present, RICHARD N. DYER, Esq., for Complainant.  
THOMAS F. SHERIDAN, Esq., for Defendant.

**Frank L. Dyer.**

FRANK L. DYER, being duly sworn, testifies as follows:—

DIRECT-EXAMINATION BY RICHARD N. DYER, of counsel for complainant.

376

1 Q. What is your name, age, residence and occupation?

A. Frank L. Dyer; age, 33; Montclair, New Jersey; patent lawyer and mechanical expert.

2 Q. What experience have you had qualifying you to testify as an expert in reference to patents for inventions, and particularly those relating to the phonographic art?

A. After passing through the public schools of Washington, D. C., I entered the law office of my

JIT COURT,

ILLINOIS,

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In Equity No.  
26598.  
On Patent No.  
713209.

complainant pursuant  
Farlor, Esq., a Notary  
consent, at 31 Nassau  
ork, this 17th day of

Esq., for Complainant.  
t, Esq., for Defendant.

Dyer.

sworn, testifies as fol-

RD C. DYER, of counsel

, residence and occu-

Montclair, New Jersey ;  
xpert.

you had qualifying you  
nce to patents for in-  
e relating to the phono-

the public schools of  
the law office of my

father, Colonel George W. Dyer, in that City, to study patent law and soliciting, and on the death of my father in 1889 I succeeded to his business. The first three years after entering my father's office I was a student at the Corcoran Scientific School, a branch of the Columbian University of Washington, D. C., devoting myself almost exclusively to the study of mechanics and chemistry. I took a three years course at the Columbian Law School.

During the course of my business career I have 378  
had occasion to prepare and prosecute before the Patent Office more than one thousand applications for patents relating to inventions in a great many of the mechanical and chemical arts, I have also had occasion to examine the patents relating to many of the industrial arts, including the printed literature on the subject, for the purpose of determining the probable novelty and patentability of inventions submitted to me for that purpose. I have also had occasion frequently to compare mechanical 379  
structures and chemical processes and formulas with Letters Patent for the purpose of expressing opinions on questions of infringement. I have also been frequently retained and have frequently testified as an expert in patent suits, including suits based on patents relating to the phonographic art including the duplication of phonographic records, and in this work have been called upon to institute comparisons between patented inventions, devices and processes and alleged infringements of the same. In fact, during my entire 330  
business career I have been continually employed in the consideration of patents and inventions.

Personally I have made a large number of inventions myself in many different arts, for which up to the present time about fifty applications for patents have been filed.

I have been familiar with the phonographic art since its commercial inception, and in fact was one of the first commercial users of a phonograph, making use of such an instrument in my business about the year



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1890. Since that time I have kept a close track on this art and have been in intimate touch with its development. In 1897 I moved to New York and since that time have had exclusive and personal charge of all of Mr. Edison's patent applications, many of which have related to phonographs. On April 1st 1903, at Mr. Edison's request, I moved my office to the Edison Laboratory at Orange, N. J., where I have been even more closely identified with Mr. Edison's work. I am a member of the American Society of Mechanical Engineers, my membership in that society having been secured by reason of my own work as an inventor and designer of special machinery.

382

3 Q. Have you read and are you familiar with the patent in suit No. 713209 granted November 11, 1902, and do you understand the invention described and shown therein?

383

A. I have read the patent and am entirely familiar with the same, since the original application therefor was prepared by me and I had in charge the entire prosecution of the case in the Patent Office, including the handling of the several interferences in which that application was involved.

4 Q. Please give your understanding of the invention described in the patent in suit and particularly set forth in the 2nd, 3rd, 4th, 5th, 9th, 10th and 17th claims thereof?

384

A. The patent in suit relates to a process of producing duplicate copies of phonographic records or so-called phonograms, and the object of the invention is stated in the patent to be—

\* \* \* "to produce a practical process for the duplication of phonographic records, whereby a practically unlimited number of duplicate phonographic records may be obtained which will be absolutely identical in every respect with the original record."

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The accomplishment of this object presented very  
great difficulties in view of the microscopic character of  
the sound groove. The microscopic character of the  
record surface can be best appreciated when we con-  
sider the dimensions of the devices which produce the  
same. In the first place, the maximum width of the  
path of the record is only one one-hundredth of an inch,  
and in this extremely narrow area the record is cut by  
an engraving recorder having a circular edge .035  
inch in diameter. Since the recorder is three 385  
and a half times as wide as the width of the maximum  
path in which the record groove is formed, it follows  
that the very deepest portion of the groove is extremely  
shallow, being in fact less than one one-thousandth of  
an inch in depth. Other portions of the record are  
manifestly more shallow, being perhaps less than one  
ten-thousandth of an inch in depth. In these  
extremely minute limits of width and depth, sound  
waves to the extent of several hundred thousand for 386  
each record are formed, each having its characteristic  
shape and dimensions, and in order that such a record  
may be accurately copied it is necessary that these  
dimensions should not be departed from in the  
duplicate, because if that were done, a reproduction  
of the sound from the copy would be false and  
distorted. When the fact is recalled then that in this  
art Mr. Edison set out to make absolutely exact copies  
of articles carrying on their peripheries records of an  
average width of less than one one-hundredth of an  
inch and an average depth of less than one one- 387  
thousandth of an inch, the problem presenting itself  
was an extremely difficult one, and to a less audacious  
man practically impossible. Obviously a process  
having to deal with the duplication of these articles  
must be one of mathematical exactness and of extreme  
delicacy. 388

Having referred to the object of the invention, the  
patentee proceeds:

" \* \* \* Generally I propose to construct  
a suitable matrix, preferably in metal, and by



389

its use to impress duplicate phonograms with a phonographic record thereon, such phonograms being preferably constructed of a material having a greater co-efficient of expansion than the material of the matrix or mold.

390

"By my process the duplicate phonogram or the surface thereof may be and preferably is constructed of a material too hard for the satisfactory cutting of an original record therein by the usual phonographic recorder, whereby the duplicate phonograms may be made more durable than it is possible to make original records; but the duplicate phonograms may obviously be made of a softer material."

391

Although the patent in suit states that the process "can be carried out for the reproduction of phonographic records of any desired form, either flat disks or hollow cylinders," it points out that "it has been specially devised for use in connection with the duplication of records of the latter type." Regarding these cylindrical records, the patent states that the—

\* \* \* "improved process also provides for the effective removal of the finished duplicate from the matrix without injury to the record surface of the former."

392 The patent in suit does not claim any originality or novelty for the process of making the matrix, but states that the matrix "can be produced by any of the known processes, as for example those indicated in my patent No. 484582 dated October 18, 1892." In describing these suggested processes for making the matrix, the patent in suit states:

\* \* \* "As I explained in this patent, an original phonographic record having a surface of the usual wax-like material is first secured and its surface coated with a coating of conducting



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ned in this patent, an  
 eord having a surface of  
 al is first secured and  
 Coating of conducting

material in order to permit the original record  
 to be electroplated. This conducting coating  
 can be and preferably is applied by a process of  
 vacuous deposit, as I described in my patent  
 No. 526147 dated September 18, 1894, by plac-  
 ing the record in a vacuum chamber in which a  
 metal is vaporized by an electric arc produced  
 between electrodes of the metal, the metallic  
 vapor depositing as a thin uniform coating on  
 the original record. I prefer to apply a prelim- 393  
 inary coating by a process of vacuous deposit,  
 for the reason that the highly comminuted con- 394  
 dition of the vaporized metal permits the coat-  
 ing to form as a uniform film, following accur-  
 ately all the variations of the record, however  
 minute. Instead of coating the original record  
 with a vaporized metal, it may be coated with a  
 very thin layer of specifically prepared plum-  
 bago of exceedingly great fineness, or instead  
 thereof gold-leaf or silver salts reduced by 395  
 chemical reagents to the metallic state may be  
 used for the same purpose. Having thus ap-  
 plied a very thin preliminary coating to the  
 original record, the latter is immersed in an  
 electroplating bath and electroplated with a  
 metal to the desired thickness, thereby forming  
 a shell inclosing the original record, which shell  
 carries on its bore an accurate negative repre-  
 sentation of that record. Preferably this  
 shell is suitably incased in a close-fitting 396  
 cylindrical jacket, although if the electro-  
 plating is carried on long enough  
 to form an electroplated coating of  
 sufficient thickness a jacket need not be used.  
 The original record is removed from the electro-  
 plated matrix obtained as described either be-  
 fore or after the jacket, if used, is applied to  
 the shell. This removal of the original record  
 can be effected either by dissolving or melting  
 the waxlike material or by contracting the orig-



397

inal record radially and removing it by a direct longitudinal movement. In the case of cylindrical phonographic records the resulting matrix will be a hollow metal cylinder or tube or one internally faced with metal carrying the phonographic record in relief upon its inner surface.

398

"While I have indicated convenient and well known methods for producing the matrix, it will be obvious that the matrix can be obtained in any other way familiar to those skilled in the art."

399

By following the instructions of the patent, a matrix will be obtained, cylindrical in form, carrying on its interior a negative representation of the record, and if the preferred process of vacuous deposit suggested in the patent has been utilized, this matrix will, on its interior, be provided with an infinitesimally thin film of the metal so deposited. Of course if the master record is given a conducting coating by the application of conducting material, as for example "specially prepared plumbago of exceedingly great fineness," as stated in the patent in suit, care must be taken not to have the particles of the coating large enough to tend to fill up the record groove, and the coating should be also applied in such a way as to be uniform throughout.

400

Having obtained a suitable matrix carrying on its bore the negative representation of the phonographic record to be duplicated, the special process described in the patent in suit for making the duplicate copies consists, first, in securing a cylindrical blank of suitable material, of which a number are mentioned in the patent in suit including celluloid; second, in placing the blank within the matrix; third, in subjecting the blank to heat so as to soften the blank slightly to permit an impression to be received on its surface; and fourth, in diametrically expanding the blank so as to result in an intimate engagement with



401

the record surface of the matrix, whereby a clean, sharp impression will be received from the latter.

After this impression has been received on the blank and the latter has been thus converted into a duplicate copy of the original or master record, the removal of the duplicate from the matrix is thus described in the patent in suit:

\* \* \* "After the blank has been expanded, so as to receive the impression of the matrix or mold, it is removed by first shrinking it radially in any suitable way, as in a refrigerating chamber, and by then withdrawing the resulting duplicate record by a direct longitudinal movement. Owing to the shallowness of the phonographic record groove this radial shrinkage of the duplicate record effects a sufficient separation of the surfaces of the matrix and of the duplicate record to prevent injury to the surface of the duplicate record due to any longitudinal contraction thereof." 402 403

While the process which I have referred to is indicated in the patent in suit as the preferred process, it is entirely clear that the patent is not to be limited to this particular or special mode of procedure in effecting the result. Several modifications are, in fact, indicated in the patent itself. For instance, the patent states that the blank alone may be heated (page 2 line 21), and also that in some instances "the entire expansion may be effected mechanically by forcing a tapering mandrel within the" blank. The statement in the patent that the tapering mandrel is "preferably" used (page 2 line 43) also indicates that the use of the mandrel may be omitted and the impression secured by other means. 404

As a result of the process which the patent describes, the specification states that—

\* \* \* "duplicate phonographic records can be obtained which will be accurate repro-



405

ductions of the original records and be free from extraneous noises and wherein the quality and intensity of the original vibrations will be reproduced with absolute faithfulness. I find, moreover, that since by this process there is little or no wear upon the matrix or mold a practically unlimited number of duplicates may be obtained from a single matrix or mold."

406

At the present time practically all of the records made and sold by the National Phonograph Company are duplicate records produced by processes analogous to that of the patent in suit and embodying the invention thereof. These duplicate records are made to the extent of many thousands a day and are of the highest character. Strange as it may seem, the duplicates are actually superior to the original masters, inasmuch as their record grooves are smoother than the

407 originals, and consequently reproductions obtained from them are freer of scratching or rushing sounds, which are present to a greater or less extent with reproductions secured from original records. Furthermore, as suggested in the patent in suit, these duplicate records, as actually made, are formed of a harder material than the original masters, so that they are consequently more durable than such originals

Referring now to the claims to which you have directed my attention, I find the second claim to be

408 thus stated :

" 2. The method of producing hollow cylindrical phonograms, which consists in obtaining a mold having a reverse phonogram record on the inner wall of a cylindrical opening, forming a hollow cylindrical plastic phonogram within said mold, releasing the phonogram from the mold by a radial contraction of the phonogram sufficient to entirely clear the surfaces, and removing the phonogram from the mold by direct longitudinal movement."

This claim, it will be noted, is very broad and comprehensive in character and practically includes all processes of making hollow cylindrical duplicate copies of a phonograph record in which a matrix or mold is used having a negative representation of the record on its inner wall and in which a hollow cylindrical plastic phonogram is formed within said mold and is afterwards released by a radial contraction of the phonogram sufficient to entirely clear the surfaces and to permit the duplicate copy to be directly removed from the mold. 410

The third claim is as follows :

" 3. The method of producing hollow cylindrical phonograms which consists in obtaining a mold having a reverse phonogram record on the inner wall of a cylindrical opening, forming a hollow cylindrical plastic phonogram within said mold, releasing the phonogram from the mold by a reduction in temperature sufficient to entirely clear the surfaces, and removing the phonogram from the mold by direct longitudinal movement." 411

This claim is substantially like the second, except that it recites the utilization of a reduction in temperature to secure the radial contraction of the duplicate. The third claim is therefore necessarily limited to a process in which the shrinking of the duplicate is secured by a reduction of temperature, while the second claim is not so limited and would cover a process in which a radial contraction of a formed duplicate was effected in any way. 412

The fourth claim is as follows :

" 4. The method of producing phonograph cylinders which consists in placing within a hollow cylindrical record mold or matrix a hollow cylindrical phonograph blank of sufficient thickness to maintain its shape during and after



413

its engagement with the matrix, outwardly expanding such blank against said matrix, disengaging the impressed record cylinder from the matrix, and withdrawing said record cylinder from the matrix by direct longitudinal movement."

414

This claim is limited to a process in which a cylindrical blank is introduced into the mold, and covers such a process when carried out by expanding the blank into engagement with the record surface, by then contracting the blank from the matrix so as to clear the engaging surfaces, and finally directly withdrawing the resulting duplicate. The claim is limited to the carrying out of the process in connection with a blank which is "of sufficient thickness to maintain its shape during and after its engagement with the matrix". With such a blank it is therefore necessary that the separation between the engaging surfaces

415 should be effected by a diametric shrinkage or contraction of the duplicate record, and a blank of this thickness possesses sufficient mass to result in the necessary diametric contraction. The limitation in question was introduced into the claim in view of a prior British patent to Young cited during the prosecution of the Edison application and wherein duplicates were formed on very thin walled cylinders which could not be contracted, as with the invention of the patent in suit, but which required to be removed by

416 collapsing them so as to change their shape and effect a separation of the engaged surfaces. Such an expedient would be entirely impracticable in the present condition of the art, because no records are now commercially made which could be removed from a mold by collapsing them without entirely destroying their shape and making them commercially useless.

The fifth claim is as follows :

"5. The method of producing phonograms which consists in placing within a hollow cylin-



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aid matrix, disen-  
cylinder from the  
d record cylinder  
ongitudinal move-

drical record matrix a hollow cylindrical phono-  
graph blank of sufficient thickness to maintain  
its form under normal conditions, softening said  
blank by heat and expanding the same while  
heated so as to take the record from the matrix,  
shrinking the phonogram so made by change of  
temperature, and withdrawing the same from  
the matrix by direct longitudinal movement."

in which a cylin-  
mold, and covers  
expanding the blank  
surface, by then con-  
so as to clear the  
directly withdraw-  
claim is limited  
cess in connection  
it thickness to main-  
engagement with the  
therefore necessary

This claim covers a process for duplicating records 418  
by introducing a non-collapsible blank in the mold,  
softening it by heat, then expanding the heated blank  
so as to take an impression from the record surface,  
then in reducing the temperature so as to cause the  
blank to contract diametrically and thereby permit a  
withdrawal of the duplicate from the mold.

The ninth claim is as follows :

e engaging surfaces  
shrinkage or con-  
and a blank of this  
ss to result in the

"9. The process of duplicating cylindrical 419  
phonograms having a phonographic record  
thereon, which consists in depositing a metal on  
said phonogram to form a matrix or mold  
wherein the original record will be reproduced  
in relief, in inserting the continuous cylindrical  
blank to be reproduced within said matrix or  
mold, in expanding the blank into intimate en-  
gagement with the record in relief carried by  
the bore of said matrix or mold, the cylindrical  
blank being sufficiently thick to maintain its 420  
shape during and after the act of disengagement  
from the matrix, and finally removing the cylin-  
der by direct longitudinal movement, substan-  
tially as set forth."

The limitation in  
e claim in view of a  
ted during the prose-  
and wherein dupli-  
alled cylinders which  
th invention of the  
l to be removed by  
their shape and effect  
faces. Such an ex-  
ticable in the present  
records are now com-  
re-oved from a mold  
rely destroying their  
tally useless.

This claim is substantially the same as the fourth  
and contains the limitations thereof, but also includes  
the preliminary step of depositing a metal on the  
original master record "to form a matrix or mold  
wherein the original record will be reproduced in  
relief".

roducing phonograms  
within a hollow cylin-



421

The tenth claim is as follows:

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" 10. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram so as to form a matrix or mold, in inserting the blank to be reproduced within said matrix or mold, in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, in finally shrinking the blank to disengage it from the matrix or mold, the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth."

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This claim contains the limitations of, and covers the same process as, the ninth claim, but is specifically limited to the shrinkage of the duplicate so as to disengage it from the matrix or mold. The ninth claim, on the other hand, would cover the separation of the duplicate from the mold in any other way.

The seventeenth claim is as follows:

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" 17. The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and then outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix and finally removing the cylinder or tube by direct longitudinal movement."



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This claim was involved as the issue of the interference in the Patent Office between the application for the patent in suit and Lambert patent No. 645920 dated March 20, 1900, of which issue Mr. Edison was declared by the several tribunals of the Patent Office to be the first inventor. At the time of the interference in question the claim was the 11th claim of the Edison application. It covers a process for duplicating phonograms consisting in first making an original master record on a cylindrical blank of wax or other relatively soft material, then in rendering the surface of the master record electrically conductive so that a metal can be electroplated thereon, then in electroplating such a metal on the prepared master so as to form a matrix, then in outwardly expanding under pressure within the matrix a non-collapsible tubular blank of material soft enough to receive an impression from the matrix, and finally in removing from the matrix the duplicate record so secured.

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5 Q. Have you read and do you understand the testimony so far taken in this cause? 427

A. I have and do.

6 Q. Have you ever examined the process of making duplicate phonograph records as practiced by the defendant; and, if so, when and under what circumstances?

A. Yes, I have examined the process as practiced by defendant herein. Early in July of this year I was informed by counsel for complainant that defendant had offered to show its process to an expert, and was requested to undertake the examination of defendant's operations. I was informed at the time that defendant's factory was shut down, but I had some correspondence with Mr. A. D. Philpot, the secretary of the defendant Company, and arranged to make the examination with him on July 23rd. I therefore went to Chicago, and in company with Mr. Henry Hecht Jr., a mechanic in the employ of complainant, I went with Mr. Philpot to the factory of the Lambert Company and there witnessed the operation of making 428



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duplicate phonograph records. This was on Thursday July 23, 1903. The process which was thus exhibited to me was represented as being the process which the defendant corporation had been carrying on for some time previously, including the time between the grant of the patent in suit and the filing of the bill of complaint herein.

7 Q. Did the process which was exhibited to you at defendant's factory on July 23, 1903, differ  
430 from the process which was practiced by the defendant between November 11, 1902, the date of the patent in suit, and January 5, 1903, when the bill of complaint was filed, as testified to in the depositions of Rustad, Bloom and Philpot taken herein; and, if so, in what respect?

A. Not in any material respect. It appears from the testimony of Rustad and Bloom that in the carrying out of defendant's process between the dates referred to, the molds, after the impression on the duplicate had  
431 been received, were placed to one side and the duplicate was allowed to cool until it had contracted sufficiently to completely clear the engaging surfaces and permit the duplicate to fall out of the mold by its weight. Mr. Rustad states that the time allowed for this contraction was about half an hour, but he explains that the time necessary for permitting the contraction of the duplicates to take place was not lost, owing to the fact that a large number of molds were made use of, so that the workman was kept busy all the  
432 time, and the machines for effecting the expanding operation were also in constant use. When I visited the factory of the Lambert Company, Mr. Hecht and myself were shown the various operations which were carried out in making the molds and in preparing the blanks for introduction into the molds, but these operations at that time were not being carried out commercially and such parts of the plant were therefore practically idle, except that the plating baths were in operation for making molds. When we reached the machines in which the expansion of the blanks was



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effected, the foreman of the shop, who accompanied us, took charge and performed the operations himself. After a blank had been expanded into engagement with the mold, it was not laid to one side and permitted to cool, as described in the depositions of Rustad and Bloom, until contracted sufficiently to fall out by its weight, but the contraction was allowed to progress for a shorter time, so that in removing the records from the molds some force had to be used. I saw at the time that this was a bad practice, because 434 to forcibly remove the duplicate before the engaging surfaces had completely cleared each other would very likely result in injury to the surface of the mold, and in fact the foreman of the shop, who was carrying on this process for me, showed me a mold from which he had just removed a duplicate, and pointed out a bad scratch therein. He said that when duplicates were removed in this way there was always danger of injuring the mold. In order that I might satisfy myself that with the process which I thus saw practiced at 435 defendant's factory there was a diametric contraction of the duplicate from the mold, I requested the foreman to try to remove one of the duplicate records immediately after the impression had been taken and while still hot. He tried to do this but was entirely unsuccessful although apparently exerting all the strength that he had, and the duplicate came out only when it had cooled sufficiently to separate the surfaces. I could not see at the time why the defendant company should be practicing such 436 a crude and objectionable process when by merely waiting until the duplicates had cooled sufficiently they would drop out without any possibility of the record surfaces being injured. At the same time I accepted the demonstration which was made in my presence as having been made in good faith, although I recognized that it fully embodied the Edison invention, and that so far as infringement was concerned, it was immaterial whether the process was carried out as I saw it practiced or the contraction was allowed to pro-



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gress to its finality. I now find, from the depositions of Rustad and Bloom, that this demonstration was in the nature of an imposition upon me, and that the process which I saw practiced was not the process which defendant commercially practiced; and further, that the process which defendant commercially practiced was one in which the contraction was allowed to progress to such an extent as to permit the duplicates to fall out of the molds by their weight.

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8 Q. Have you read and do you understand the Lambert patents No. 645920 granted March 20th 1900, Nos. 742454 and 742455 granted October 27th 1903, and the Messer patent No. 705772 granted July 29th 1902?

A. Yes, I have read these patents and understand the inventions which they describe.

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9 Q. Did the process which was exhibited to you at defendant's factory in July 1903 differ from the process which was practiced by the defendant prior to May 1902 as testified to by the witness Lambert; and, if so, in what respect?

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A. Only in the immaterial respect to which I have before referred, that as the process was exhibited to me the duplicates were forcibly removed before they had completely contracted. Mr. Lambert in his deposition states that the process and apparatus which were used by the defendant company prior to May, 1902, are those described in Lambert patents Nos. 742454 and 742455 dated October 27th 1903. Referring to these patents I find that they describe the introduction of a non-collapsible blank into a mold, softening the same by heat, and expanding the softened blank by internal pressure exactly as I saw the process practiced at the time of my visit to the Lambert factory. The Lambert patents, however, state that—

“ the cooling of the record cylinder also shrinks it, so that it can be easily removed from engagement with the matrix.”



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From this statement in the patents it is clear, therefore, that the process which was used by the defendant Company prior to May 1902 was the process described in the depositions of Rustad and Bloom, and not the fictitious process which was exhibited to me, although, as I have said, the latter was the full equivalent of the former. As a matter of fact, Mr. Lambert, in answer to questions 8 to 11, states that when he was connected with the defendant Company prior to May 1902 the cooling of the record cylinder effected the shrinkage so 442 as to permit its easy removal.

10 Q. Please compare the process for making duplicate phonograph records practiced by the defendant between November 11, 1902, and January 5, 1903, with the process described in the patent in suit and particularly set forth in the 2nd, 3rd, 4th, 5th, 9th, 10th and 17th claims thereof, and state whether or not in your opinion the process used by the defendant embodied the invention embraced by said claims?

A. Defendant's process as it is described by the 443 witnesses in this case and as it was exhibited to me in July 1903 is identical with the process of the Edison patent in suit, except as to trivial and unimportant details. In order that the similarity between the two processes may be best appreciated, the following comparison may be instituted between them:

1. With each process a master record is first made on an ordinary phonograph blank of waxlike material. 444
2. With each process the master record is coated on its surface with a thin uniform film of conducting material. This film with the Edison invention is preferably applied by a process of vacuous deposit, but the patent in suit also refers to the use of finely divided plumbago. With defendant's process finely divided plumbago is made use of and is applied to the cylinder, and I saw it applied to a record by means of a swab of cotton wool.



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3. With each process the original master record with the conducting film thereon is introduced into a plating bath and a layer of copper electrically plated thereon, after which the original master record is shrunk out.

4. With each process the copper shell obtained in this way is backed up and strengthened by an outer jacket so as to form a complete matrix.

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5. With each process a non-collapsible tubular blank is introduced into the matrix and softened by the application of heat.

6. With defendant's process the blank so used is made of celluloid, whereas with the patented invention celluloid is one of the materials specifically referred to by Mr. Edison.

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7. With each process the blank, after being heated so as to be sufficiently softened to take an impression from the matrix surface, is expanded outwardly into engagement with the matrix surface. With the specific process of the patent in suit this expansion is effected by the concurrent application of heat and an expanding mandrel; whereas with defendant's process the expansion is effected by the use of steam and compressed air.

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8. With each process, after the blank has been thus expanded so as to take an impression from the matrix, the temperature of the duplicate is reduced so as to cause it to contract diametrically away from the matrix surface.

9. Finally, with each process the contracted duplicate is directly removed from the matrix by a direct longitudinal movement, either by lifting it out or by permitting it to fall out by its weight, as described by Rustad, Bloom and Lambert.

Thus I find that the process of the Edison patent in suit has its exact counterpart in the process as practiced by the defendant Company, and that these processes are similar even in small details and are carried



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out in the same way with the same material and ac-  
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only difference which appears to exist between defend-  
ant's process and that set forth in the patent in suit  
resides in the fact that with the former the heating  
and expansion of the blank are effected by the use of  
steam and compressed air, while with the patented  
invention as specifically described the heating  
was effected by "a heated atmosphere", while  
the expansion, aside from that due solely to the  
rise in temperature, was effected by the use of  
a tapering mandrel. These details are not essential to  
the patented invention, at least as defined by the  
claims to which you have called my attention. Of  
course I have assumed that the process as practiced by  
defendant between November 11, 1902, and January 5,  
1903, was that described by Rustad and Bloom,  
wherein the duplicates, after receiving the impression,  
were contracted so as to fall out of the mold by their  
weight. If, however, the process practiced by defend-  
ant at that time was like that exhibited to me, wherein  
the duplicates were forcibly removed before they had  
contracted completely, that fact would not alter the  
substantial identity between defendant's process and  
the patented invention, but at most would be the  
carrying of the Edison invention into effect in an ob-  
jectionable and less advantageous way.

Making a comparison between defendant's process  
and the second claim of the patent in suit, I am of the  
opinion that defendant's process complies with the  
limitations of the claim. In other words, defendant's  
process is a method of producing hollow cylindrical  
phonograms which consists in obtaining a mold having  
a reverse phonogram record on the inner wall of a  
cylindrical opening, forming a hollow cylindrical  
plastic phonogram within said mold, releasing the  
phonogram from the mold by a radial contraction of  
the phonogram sufficient to entirely clear the surfaces,  
and removing the phonogram from the mold by a  
direct longitudinal movement.



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I am also of the opinion that defendant's process embodies the invention of the third claim of the patent in suit, because with that process the release of the phonogram from the mold is secured by a reduction in temperature sufficient to entirely clear the surfaces. This of course is so whether the process is that described by Rustad and Bloom, or the one which was exhibited to me, because it would be physically impossible to remove an expanded duplicate record from a continuous metallic mold until the former had contracted so that the surfaces would be clear.

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In my opinion the defendant's process embodies the invention of the fourth claim of the patent in suit, since with that process a hollow cylindrical record mold or matrix is secured, a hollow cylindrical phonograph blank of sufficient thickness to maintain its shape during and after its engagement with the matrix is introduced within the matrix, that blank is then expanded outwardly against the matrix, it is then disengaged from the matrix after an impression has been secured, and it is finally withdrawn from the matrix by direct longitudinal movement

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In my opinion defendant's process embodies the invention of the fifth claim of the patent in suit, because with that process the blank, which is of sufficient thickness to maintain its form under normal conditions, is placed within a hollow cylindrical record matrix and softened by heat, it is then expanded while heated to take an impression from the matrix, it is then contracted or shrunk by a reduction in temperature, and it is finally withdrawn from the matrix by direct longitudinal movement.

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In my opinion defendant's process embodies the invention in the ninth claim of the patent in suit, because with that process an original master record is first secured, a metal is deposited on the master record to form a matrix or mold therein the original record will be reproduced in relief, a continuous cylindrical blank is then inserted within the matrix or mold, said blank being of



sufficient thickness to maintain its shape during and after the act of disengagement from the matrix, the blank is then expanded into intimate engagement with the record in relief carried by the bore of said matrix or mold, and the duplicate thus secured is finally removed by direct longitudinal movement.

I am of the opinion that defendant's process embodies the invention of the tenth claim of the patent in suit, because, in addition to complying with the requirements of the ninth claim, the duplicate record, after being expanded into engagement with the matrix, is shrunk diametrically so as to disengage it from the matrix or mold prior to its longitudinal removal therefrom. 458

I am, finally, of the opinion that defendant's process embodies the invention of the seventeenth claim of the patent in suit, for the reason that with that process a record is first formed on a cylinder of wax or other relatively soft material, the surface of the original master record so secured is then rendered electrically conductive, a metal is then electrolytically deposited on the master to form a matrix, a cylinder or tube of soft material is then expanded under pressure within the matrix, said cylinder or tube being sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and the resulting duplicate so secured is finally removed by direct longitudinal movement. 459

11 Q. It was asserted by defendant on its motion to amend its answer and in its petition for rehearing of the first motion for preliminary injunction in this case, that it had not practiced the invention of the original Lambert patent No. 645920 granted March 20, 1900 (which was in interference with the patent in suit) since the grant of the patent in suit. Is this attitude of the defendant warranted, in your opinion, by the facts? 460

A. No, it is not. I observe from reading the moving papers on the first motion for preliminary injunction, that subsequent to the grant of the patent in suit Lambert records were put on the market and marked with



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the date of the Lambert patent in question, and Mr. Philpot in his deposition says that this patent mark was used on the records up to the Christmas holidays of 1902, which would be subsequent to the grant of the patent in suit. At that time the original patent mark seems to have been taken off of the Lambert records and the date of the Messer patent, viz. July 29, 1902, substituted, and when I visited the Lambert factory Mr. Philpot stated to me that his Company was operating under this Messer patent. The Messer patent,

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the Lambert patents of October 27, 1903, and the Edison patent in suit, all describe one and the same process, wherein a blank is introduced into a mold, is softened by the application of heat after such introduction, is then expanded by mechanical pressure so as to take an impression from the matrix surface, is then contracted diametrically by a reduction in temperature so as to clear the engaging surfaces, and is finally withdrawn by a direct longitudinal movement. In the case of the

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process of the original Lambert patent of March 20, 1900, the procedure was specifically different. With that original process the matrix or mold was made exactly as is now done by the defendant Company. A cylinder or tube of cellulose or vulcanized rubber "either in a raw or partially cured state or previously softened in some solution" was then introduced within the mold "and by means of an expansive pressure with heat forced outwardly, completely filling the matrix, and against the inner surface thereof, thus

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making a counterpart of the same and a record similar to that on the original wax cylinder." For the removal of the finished duplicate record the original Lambert patent states:

"The ring thus formed, having on its outer face a faithful imprint of the matrix, is then allowed to harden either naturally or by artificially curing the surfaces thereof, through which hardening it shrinks sufficiently to enable its subsequent removal to



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be made from the matrix without injury to either. As a shrinking or reducing medium I have used a solution of hydrochlorous acid and water, in which the tube and matrix are placed as above, so that the tube can be removed from its engagement with the matrix." (Page 2 lines 7-19.)

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It will thus be seen that the process described in the original Lambert patent was specifically different in two respects from the specific process of the Edison patent in suit as well as from the specific process which the defendant Company is now using and which is described in the Messer patent and in the Lambert patents of October 27, 1903. In the first place, with the original Lambert process the softening of the material was effected prior to the introduction of the blank into the mold by means of a treatment with some solvent; and in the second place, the shrinkage of the finished duplicate was not effected by a reduction in temperature, but was secured by immersing the matrix and duplicate in a solution of hydrochlorous acid and water. After the original Lambert patent was issued, an interference was declared by the Patent Office with the application for the Edison patent in suit, and the issue of that interference was defined in the language of the first claim of the original Lambert patent corresponding identically with the 17th claim of the patent in suit. After that interference was declared, efforts were made by Lambert's attorney to have it dissolved on the ground that there was no interference between the two processes because of the specific differences between them. This question was fully considered both by the Primary Examiner in the Patent Office and by the Commissioner of Patents on appeal, and both of these tribunals held that the issue was broad enough to include both processes. The Lambert Company apparently acquiesced in the interpretation which the Patent Office thus put on the interference issue, and consequently on the first claim

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of the original Lambert patent, by thereafter contesting the question of priority of invention on the issue thus interpreted and by continuing to mark its duplicate records with the date of the original Lambert patent notwithstanding the fact that at least as early as May 1902 it was using its present process, which I have shown to be identical with that of the Edison patent in suit. The process which the Lambert Company practiced subsequent to the date of the patent in  
470 suit was identical with the process which it practiced at least as early as May 1902, and there was therefore no change in its operations which would warrant the substitution of one patent date for another in the marking of its records, so that the motive for this change must be found elsewhere.

Making a specific answer to your question therefore, it is clear to me that if the first claim of the Lambert patent of March 20, 1900, is given the interpretation  
471 which the Patent Office put upon it when in interference and which the defendant Company accepted and acquiesced in (by contesting the question of priority of invention of the issue as so construed and by long continued marking of its records with the patent date), the Lambert Company was practicing the invention of the original Lambert patent subsequent to the grant of the patent in suit.

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Complainant's counsel states that in order to make the record show the preliminary proceedings in the case, he offers in evidence and will print as a part of complainant's record the following papers on file in the case, to wit:

Notice of motion for preliminary injunction dated January 7, 1903.

The affidavit of John R. Taylor sworn to December 31, 1902, and the exhibits attached thereto.

The affidavit of George M. Nesbitt sworn to December 23, 1902.

Defendant's original answer filed March 2, 1903.



## 119 Memorandum of Judge Kohlsaat of June 17, 1903.

Defendant's notice of motion for leave to amend its answer dated June 18, 1903.

Defendant's petition for rehearing sworn to June 18, 1903.

Affidavit of A. D. Philpot sworn to June 18, 1903.

Defendant's motion to amend answer dated June 19, 1903.

Defendant's amendment to answer dated June 18, 1903.

Memorandum of Judge Kohlsaat dated July 29, 1903.

Affidavit of Frank L. Dyer sworn to July 27, 1903.

Affidavit of H. C. Hecht Jr. sworn to July 24, 1903.

Second affidavit of Frank L. Dyer sworn to November 7, 1903.

Complainant's counsel offers in evidence the model exhibits on file which are referred to in the affidavits of Nesbitt and Hecht already identified.

By Mr. Sheridan: The exhibits just introduced are objected to, (1) because they are incompetent, irrelevant and immaterial; (2) because they uselessly encumber the record; (3) because Messrs. Taylor, Nesbitt and Hecht have not been produced for cross-examination, and therefore their affidavits are merely hearsay evidence; and (4) because defendant's original answer, defendant's motion for leave to amend, and defendant's amendment are all part of the record, and must be printed in defendant's record.

Signature and certificate waived.

Complainant's counsel gives notice that complainant's prima facie case is closed.

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the exhibits attached

M. Nesbitt sworn to

answer filed March 2,



National Phonograph Company,	} In Equity. No. 26,598.
Complainant,	
vs.	
Lambert Company,	
Defendant.	

Testimony taken on the part of defendant before Annie C. Courtenay, a notary public, acting as special examiner by agreement, at the office of Thomas F. Sheridan, 204 Dearborn street, Chicago, Illinois, Friday, January 22, 1904, pursuant to notice.

Present:

Thomas F. Sheridan, Esq., for defendant;

Philip C. Dyrenforth, Esq., for complainant.

ALBERT D. PHILPOT, a witness produced, sworn and examined on behalf of defendant, deposes and testifies as follows, in answer to questions by Mr. Sheridan:

Q. 1. State your name, age, residence, and occupation.

A. Albert D. Philpot; 46 years; Chicago, Illinois. I am secretary of the Lambert Company, defendant in this suit.

Q. 2. What, if anything, do you have to do with the manufacture of records by the Lambert Company? A. I have the general management of the manufacture of records of the Lambert Company.

Q. 3. How long have you had to do with the manufacture of the Lambert Company's records? A. I have had sole charge for a year and a half, and was associated with my brother a year prior to that time.

Q. 4. Are you acquainted with the different letters pat-

ent of the United States which have been issued from time to time to the Lambert Company?

A. I am.

Q. 5. These patents, as I understand it, are No. 645,920, No. 742,454 and No. 742,455, granted to Thomas B. Lambert and assigned to the company, and No. 705,772, granted to W. F. Messer and assigned to the company. Are these some of the patents with which you are acquainted or not?

A. I am acquainted with all of these patents.

Q. 6. Will you please give a brief history of these different processes described in these several patents, stating which of these processes you are now operating under, and why you abandoned the other processes, if you did?

A. The original Lambert patent we abandoned because we found it was not commercially valuable. We used a thick, heavy tube of celluloid, without end flanges. The steam and water were continually getting behind the celluloid tube, and the waste and loss of material was very great. After a record was made a ring of celluloid was sealed in each end of the record, forming a flange or integral bushing, for the purpose of holding the record on the mandrel of the phonograph. This material was sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, which was one of the steps in the process of the first Lambert patent. We found this process very objectionable for several reasons, (1) on account of the tremendous expense of material involved; (2) on account of being unable to expand the material uniformly and quickly; and (3) because there was no means set forth in the Lambert process for permitting the air, steam, and water that might be confined to the surface of the celluloid cylinder and the

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bore of the matrix to escape. It seemed for a time as if we would have to abandon the making of celluloid records altogether. The Lambert processes were not complete; the final step was lacking. There seemed, so far as we knew, no way in which a commercially perfect celluloid phonograph record could be produced.

Some time before July 20, 1902, after we had practically determined to give up the manufacture of celluloid phonograms, and after Mr. Lambert had deserted the company, William F. Messer, an employee of the Lambert Company, conceived the idea of forming a celluloid record cylinder of very thin celluloid—so thin that when it was softened it could be stretched or expanded uniformly, so that the air could be gradually driven from between the record cylinder and the matrix to and out of each end of the apparatus. This record cylinder he provided with inwardly extending end flanges at each end that performed several functions, (1) they formed a perfect seal during the process of "formation"; (2) they strengthened the tube so that it was thus enabled to hold its shape after becoming disengaged from the matrix; and (3) they provided a means of holding the record cylinder upon the mandrel of the phonograph.

Q. 7. Is this process of Messer's, which you have just been describing, the process set forth in the Messer patent or not?

A. It is the process set forth in the Messer patent.

Q. 8. Is this the process which you are carrying on today in your factory, or not?

A. We are now manufacturing under this process.

Q. 9. Who was the original inventor of this last step you have been speaking about, viz, the process in which the end flanges of the celluloid rim automatically form

their own seal during the process of "formation" and the providing of an apparatus as well as process that permitted the confining of air between the record cylinder and matrix, or, in other words, permitted it to escape, so far as you are aware?

A. As far as I know this is the Messer process, as described in his letters patent No. 705,772, and dated July 29, 1902.

Q. 10. Will you tell me to what extent, if you can, the invention and adoption of the Messer process affected the manufacture and output of your company?

A. When we commenced to manufacture records under the Messer patent the improvement in the records and the lightness of the material increased our business almost at once. The enormous saving to our company also changed what was formerly a loss into a profit, and a large foreign corporation shortly afterwards made a contract with us for a tremendous quantity of our goods.

Q. 11. Is this process being carried on abroad; if so, where, and to what extent?

A. Objected to as immaterial.

A. This same process is now being carried on in London, England, where we are now manufacturing about four thousand records a day.

Q. 12. Was the commercial success of this entirely due to the adoption of a very thin celluloid, or was it due as much to the fact that Messer had as well provided for the escape of any gas, air, steam or water from between the record cylinder and the matrix?

A. It was a combination of both.

Q. 13. How many law suits has this National Phonograph Company and its subordinate company, the Edison Phonograph Company and the American Phonograph



Company, subjected your company to the expense of?

Objected to as immaterial and irrelevant.

A. I think there have been about seven different suits, as near as I can remember.

Q. 14. To what extent, if any, has this interfered with the sale of your goods on the market in the United States and Territories?

Same objection.

A. Continually being harassed by law suits and the notices sent out to the trade by the National Phonograph Company that they were suing us and that we were infringing their rights during the past two years, has been a serious loss to our company.

Q. 15. Are your manufacture and output in England as great as your manufacture and output in this country, or not?

A. It is only about one-quarter as large in this country as it is in England.

Q. 16. In other words, you are making about a thousand phonograms a day in this country. Could you, or could you not, make and sell as many in this country as you do in England, if you had not been harassed by these different law suits and your trade interfered with by complainant and its agents?

Same objection.

A. Judging from the letters that we have received from dealers who were frightened from handling our goods, I should imagine that our business could easily exceed the London business, had we not been interfered with.

Q. 17. What kind of material do you use in the formation of your phonograms at present?

A. We use the thinnest celluloid that can be manufactured in tubular form.

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*Deposition of Albert D. Philpot.*

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Q. 18. I hand you now a phonogram marked "Polish Dance, Violin Solo," and ask you if you recognize the same, and by what process it was made?

A. I recognize the phonogram, and state that it was made by the Lambert process some time in the year 1900.

Q. 19. Is that material a thick or thin one, and how were the end rings or flanges formed therein?

A. It is a thick material, and the end flanges are separate rings of celluloid and are cemented into the end of the record cylinder.

Q. 20. I hand you another phonogram entitled "Under Bamboo Tree," and ask you of what material that is formed, and by what process it is formed?

A. It is formed of thin material and manufactured under the Messer patents.

Q. 21. About when did you begin the manufacture of celluloid phonograms under the Messer process, as set forth in his patent?

A. About the time of the application for the patent, which was about Feb. 1, 1902.

Q. 22. Going back to the first phonogram that I handed you, under what, if any, of the patented Lambert processes was that produced?

A. Under patents Nos. 742,454 and 742,455, issued October 27, 1903.

Q. 23. I hand you herewith a third record marked "Couldn't Help," and ask you of what material it is formed, and by what process and apparatus it was formed?

A. It is formed of a very thin sheet of celluloid, about ten one-thousandths of an inch thick. This is formed into a tube and sealed with cement, and the process of making the celluloid record is carried out under the Messer patents.



Q. 24. Why was it necessary to make it of a sheet bent into the form of a tube and joined together as shown?

A. Because it is impossible to get a tube of celluloid of material of such thin material. We are now manufacturing our records of the thinnest material obtainable in tube form, such as the record marked "Under Bamboo Tree" is formed of.

Q. 25. About how thick is the material in the tubes that you are now using?

A. Between forty-five and fifty one-thousandths of an inch in thickness.

Q. 26. In going back to the record, which has the words "Couldn't Help" embossed thereon and to its formation, I will ask you how this record was formed?

A. After the tube was formed, it was placed in a matrix in contact with the top and bottom plate of the machine. The steam was then admitted under pressure of about forty-five pounds to the square inch. It stayed in the steam about ten seconds. Cold air was then admitted for a period of about half a minute, under pressure of about eighty pounds to the square inch. The steam softened the material, rendering it plastic. The cold air forced it into close contact with the matrix and set the material in this position. The cold air also allows the material to slightly shrink under pressure. The cold air is then shut off and the record taken out of the matrix longitudinally.

Q. 27. Did you remove the matrix from the machine before taking out the record, or not? I want you to tell exactly just how the record was separated and removed from the matrix.

A. In the case of this particular record marked "Couldn't Help," the matrix was lifted out of the machine

and the record itself dropped out without any assistance on my part, and of its own weight.

Q. 28. Who made this record?

A. I did.

Q. 29. Is this substantially the same process you have been carrying on for some time, or not?

A. It is exactly the same process.

Q. 30. Was the separation of the record from the matrix effected any quicker than usual, or not?

A. The record marked "Couldn't Help" came out much more readily than the ordinary records.

Q. 31. To what do you ascribe this quicker separation of the record from the matrix in this particular instance over your ordinary records?

A. To the thinness of the material, which loses its heat more rapidly, while the matrix retains its heat.

Q. 32. Does this thin material, when it loses its heat, cause the record to shrink radially or not?

A. The losing of its heat causes a shrinkage in material, and this shrinkage causes a separation from the matrix—such a separation as to cause it to drop out.

Q. 33. And is this process by which you form this very thin record marked "Couldn't Help" the Messer process, and the same process which you have been using, as you state, since some time in 1902, or not?

A. It was made by the Messer process.

Q. 34. What does the relative expense of the celluloid bear to the expense of producing the record?

Objected to as immaterial.

A. The material costs about two-thirds of the entire expense of producing the record.

Defendant's counsel offers in evidence the three records referred to by the witness, and requests the



notary to mark the one bearing the words "Polish Dance, Violin Solo" "Defendant's Exhibit Lambert Process Record," that bearing the words "Under Bamboo Tree" "Defendant's Exhibit Messer Process Record," and that bearing the words "Couldn't Help" "Defendant's Exhibit Messer Process Very Thin Record."

Adjourned till Saturday, January 23, at 10 o'clock  
A. M.

January 23, 1904. Parties met pursuant to adjournment. Present as before.

Q. 35. I hand you two records, or imperfect records, formed of thick tubes of celluloid, and ask you if you have ever seen these before?

A. Yes, Mr. Henry W. Carter made these imperfect records in our factory, in the presence of Mr. Miller, Mr. Hecht and Mr. Davies, who were present on behalf of complainant.

Q. 36. I will ask you if it were possible to make celluloid phonograms of material as thick as that shown in these phonograms under consideration, would it be commercially practicable to do so?

A. While I have grave doubts whether a perfect record formed of celluloid as thick as that shown in these records could ever be made, and setting aside the tremendous expense that would be involved in the process of making a commercially perfect record, the cost of the material would render it impracticable to do so. There is nearly twice as much material in these records as we used in the Lambert process records, and that was a commercial failure.

Q. 37. Considering the Edison process as disclosed in

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Deposition of Albert D. Philpot.

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the Edison patent in suit, and as interpreted by complain-  
ant's witnesses, and which, as I understand it, involves the  
formation of a tubular matrix, the bore of which is pro-  
vided with negative indentations of the sound record, the  
placing of a tubular phonogram blank in such matrix, said  
phonogram blank having a tapered bore provided with a  
tapering mandrel, the placing of matrix, phonogram blank  
and mandrel in a heated atmosphere so as to cause said  
blank to expand into intimate engagement with the nega-  
tive indentations of a matrix to partially, if not entirely,  
complete the duplication of the sound record on the pho-  
nogram blank, then, if necessary, to further expand the  
phonogram blank by means of the mandrel into final inti-  
mate engagement with the matrix, and then remove the  
completed phonogram from the matrix. Do you think  
that a celluloid phonogram can be duplicated by this pro-  
cess?

A. I am positive that a thin celluloid phonogram can-  
not be made by this process,—by this I mean such a cellu-  
loid phonogram as we are now making and selling; (1)  
in that we cannot provide such a phonogram with a taper-  
ing bore, or any other kind of a bore so as to use a taper-  
ing mandrel to expand it; and (2) in that we cannot re-  
duce the outer surface of the blank phonogram in such  
manner as to make it perfectly parallel every time with  
the bore of the matrix. As regards the thick records,  
which I have stated Mr. Carter directed the making of, it  
might be possible as a laboratory experiment, and after  
many attempts on the part of an unusually skilled me-  
chanic, to complete a record, although I doubt its being  
perfect in every particular. As a commercial process, it  
would be an absolute failure.

A thick tube of celluloid is stuffed or squirted in the



same manner as lead pipe is made. It is then hung up by the end in lengths of about six feet in a drying room, for the purpose of curing it. The process of drying renders the outside surface of the blank wavy or irregular. The inside surface is in the same condition. In order to make a celluloid record, a section of the tube—approximately four inches long—would have to be cut from the original tube. Then the outer surface would have to be turned upon a lathe to obtain as true a surface as possible. This turning process is not only a very unsatisfactory one, but is slow, tedious, and extremely difficult, on account of the character of the material. The next most difficult operation would be the boring of the inside of the tube on a taper, and unless this is perfectly done the tapering wedge will not fit the bore of the celluloid, and unless this is done perfectly the result will be an imperfect record under this process of expanding.

Q. 38. Going back to the consideration of "Defendant's Exhibit Messer Process Very Thin Record," I believe you stated that it separated and dropped out of the matrix in a short space of time. Will you kindly state how long, in seconds, it took for this record to separate from and drop out of the matrix?

A. I should think it was inside of twenty seconds.

Q. 39. Considering the manufacture of the so-called wax records of complainant, which we find on the market, by the Edison process, as set forth in complainant's patent and as referred to in Q. 37, do you think such so-called wax records are made by any such process or analogous process by complainant, or that they can be made by such a process in sufficient quantities and cheap enough to render them commercially practicable?

A. From the information derived from their own ex-

pert, Mr. Miller, and from the printed description of their process in their monthly paper, no such process is used in the manufacture of the Edison molded record; furthermore, in my opinion, such a process is absolutely uncommercial, on account of the expense and uncertainty of the results to be obtained.

BY MR. DYRENFORTH: So much of the answer as purports to be hearsay is objected to as incompetent.

ALBERT D. PHILPOT.

Cross-examination of the witness is deferred until such time as defendant can produce witness and complainant can examine him, within the time set for the taking of defendant's testimony.

Counsel for defendant herewith offers in evidence the records referred to by the witness, and requests the notary to mark the same "Defendant's Exhibit Carter Record No. 1" and "Defendant's Exhibit Carter Record No. 2."

HENRY W. CARTER, a witness produced, sworn and examined on behalf of defendant, deposes and testifies as follows, in answer to questions by Mr. Sheridan:

Q. 1. Please state your name, age, residence and occupation.

A. Henry Wallace Carter; 37 years; Chicago, Illinois; mechanical expert.

Q. 2. What experience have you had tending to qualify you as an expert witness in patent causes?

A. For the last twenty years I have been continuously engaged in mechanical studies and pursuits, and for the past fourteen years in such studies and pursuits in their relation to patents for inventions. My mechanical training began in the repair shop of the Washburn Manufac-



turing Company, Worcester, Mass., where I served an apprenticeship preliminary to entering the mechanical engineering course at the Polytechnic Institute in that city. I received my degree in 1886, and for three years thereafter worked as a practical machinist and draftsman with various machine companies. I then entered the examining corps of the United States Patent Office, where I was for several years continuously engaged in examining applications for patents and in passing upon their claims to determine their patentability in view of the prior art. Later I resigned to enter practice as a solicitor of patents and mechanical expert in all matters pertaining thereto, and am still engaged in such practice and have repeatedly testified as an expert witness in patent causes pending before the United States courts and the courts of this state. I have prepared many hundreds of applications for patents on all classes of mechanisms, and am thoroughly conversant with patent and machine specifications and drawings and with machinery in general. During my shop experience I learned the machinist's trade and was accustomed to operate all ordinary machine tools and became familiar with the general run of mechanical methods and processes. During a portion of the time that I was employed in the Patent Office I was obliged to make daily use of a graphophone in the ordinary course of my duties there, all correspondence emanating from that division being dictated to such machine, and in this way I came in contact and became familiar with phonographic devices and phonograms, to a process of making the latter of which I understand this controversy to relate. I have also been accustomed to use and observe such machines and devices occasionally ever since that time, and acted as an expert witness in the cases of the National Phonograph



Carter.

*Deposition of Henry W. Carter.*

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Company vs. Lambert Company and Thomas J. Lambert,  
in Equity, Nos. 25,788 and 25,789, lately pending in this  
court and in the Court of Appeals for the Seventh Cir-  
cuit. I am a member of the American Society of Mechan-  
ical Engineers and of the Western Society of Engineers.

For these reasons I believe myself competent to act as  
an expert witness in any cause involving patents or inven-  
tions on mechanical devices or processes, and in this cause.

Q. 3. Have you examined, and do you understand the  
patent to Edison No. 713,209 of November 11, 1902, sued  
upon herein?

A. Yes.

Q. 4. Have you read the deposition of Frank L. Dyer,  
complainant's expert witness, and "Complainant's Rec-  
ord on Motion for Preliminary Injunction"?

A. I have read Mr. Dyer's deposition and a consider-  
able portion of the record relating to the injunction mo-  
tion, so that I have a general understanding of it.

Q. 5. Are you familiar with the process of manufac-  
turing celluloid phonograms or phonographic records car-  
ried on by the defendant Lambert Company?

A. I am.

Q. 6. Please state briefly to what the Edison patent in  
suit relates, and what the process is which it discloses?

A. The Edison patent sets forth a process of dupli-  
cating phonographic records or phonograms. These rec-  
ords, as is well-known, are made originally by engraving  
a spiral or helical groove on a cylindric blank of wax or  
wax-like material, by means of the machine known as  
the phonograph, or graphophone. The engraving tool of  
this machine is connected with a diaphragm designed to  
vibrate in accordance with the air vibrations or sound  
waves produced by the human voice or by a musical in-



strument, and the vibrations of the diaphragm being transferred to the engraving tool, cause the spiral or helical line cut by the engraving tool in the wax cylinder to vary in depth at different points in accordance with the strength of the sound vibrations affecting the diaphragm at the moment. Then when the record thus cut is re-traced by a blunt pointed style attached to a diaphragm, the latter will be caused to vibrate in exactly the same manner as did the diaphragm to which the cutting style was affixed, with the result of sending out new sound vibrations in exact duplicate of the vibrations produced by the voice or musical instrument originally recorded.

These original records are thus necessarily made of a rather soft material, or wax, and are not durable. If repeatedly subjected to the action of the reproducing style the record line or thread gradually changes its shape and loses its characteristic indentations, so that the resulting sound becomes fainter and fainter, and the softness of the material renders it liable to be marred and the record surface to be destroyed, by the slightest accident or misuse in handling. Moreover, the production of original records in this manner is a comparatively and sometimes exceeding expensive operation, and the number of originals obtainable is frequently very limited, although the demand for great numbers of the same record may be very large.

It has, therefore, long been recognized as desirable that original records produced by the engraving process should be copied or duplicated in harder material by some process which would not use up or destroy the original, and which would enable the number of duplicates to be multiplied indefinitely at small expense. The Edison patent in suit sets forth one of the processes which has been proposed for this purpose, although a crude one of doubtful

practicability, and one which has never been reduced to a commercial basis, as I understand it, or, if so, to but a very limited extent, having been abandoned even by the patentee in favor of more satisfactory methods covered by other patents.

Adjourned till Monday, January 25, 1904, at 10 o'clock A. M.

Chicago, January 25, 1904. Parties met pursuant to adjournment. Present as before.

Witness Carter continues:

In the carrying out of this Edison process, a matrix is formed having a cylindric bore of the diameter of the record to be duplicated, and having upon the surface of this bore a negative duplicating relief of the engraved record line or groove of the original. The patent describes two methods of making such a matrix, one of these methods being the familiar electrotyping process, but also points out that "the matrix can be obtained in any other way familiar to those skilled in the art," which is obviously true, since it will be apparent that the particular manner of forming the matrix can have no possible bearing upon the subsequent operation of forming a duplicate record within the matrix.

A blank record cylinder having a tapered bore is then fitted within the matrix, and a tapered mandrel is inserted within the tapered bore of the blank. Then, to quote the patent (lines 30-46, p. 3):

"These parts are then subjected to heat, such as by being maintained in a heated atmosphere, whereby the blank will, by reason of its greater co-efficient of expansion than the matrix or mold, be expanded into intimate contact with the record surface of the latter and an impression of such record will be accurately



received on the blank. When the blank has been thus expanded into engagement with the matrix or mold, the mandrel C is forced tightly within the blank, so as to further expand it mechanically, whereby the blank will be forced into absolute intimacy with the record, and an impression will be received on the blank which will be clear, sharp, and an absolutely faithful reproduction of the original record."

It now only remains to remove the blank safely from the matrix. This is done by withdrawing the mandrel and cooling the blank until it contracts radially sufficiently to be drawn out endwise from the mold. The process is then complete, and the new record cylinder thus produced will, in the contemplation of the patent, be an exact duplicate of the original record from which the matrix was made, and can be used for phonographic purposes in all respects as though it was the original record. Its durability and longevity, moreover, will be greater than those of the original record, since the patent points out that the material of which the duplicate record cylinder is composed can be made much harder than that of the original record, which must be soft enough to be satisfactorily engraved, indented, or cut by a phonographic recorder. To quote the specification:

"These blanks may therefore be made of a relatively hard material, such as asphalt, or of stearic acid or stearate of soda mixed with varying proportions of fine precipitates—such as chalk, slaked lime, or lamp-black—or waxes or resins may be used, such as sealing-wax or shellac mixed with fine precipitates, like chalk or polished ebonite, vulcanized hard rubber, or celluloid may be used, or glue may be employed either alone or mixed with precipitates, such as chalk."

Q. 7. What is the object of heating the blank, or the matrix and the blank, in this Edison process?

A: The object of this step in the process is to cause the blank to force itself into intimate contact with the bore of the matrix, so as to take the impression of the latter, by its own expansive force. As the specification states, lines 18-27:

"After the blank has thus been placed within the matrix or mold both the matrix and the blank contained therein are, or the blank alone is, brought to a higher temperature, whereby the blank will expand into intimate contact with the record surface of the matrix or mold, whereby the negative record thereof will be impressed with absolute accuracy upon the surface of the blank. . . . By making the blank of a material having a higher co-efficient of expansion than the matrix or mold the blank will be properly expanded to receive the impression of the record, notwithstanding the fact that both the blank and the matrix or mold may be subjected to the same temperature."

And that this is the only object of the heating step of his process is specifically stated by the patentee in his arguments made while his application was pending in the Patent Office, for the purpose of differentiating this process from analogous precesses of the prior art cited against his claims. In these arguments and in certain affidavits filed in the Patent Office at the same time and for the same purpose, the patentee strenuously distinguishes between this heating of the blank to cause it to take the imprint of the matrix by its own expansive force, and a heating of the blank disclosed in some earlier processes, where the object was to soften the blank so that it would take the imprint of the matrix when subsequently forced into contact therewith by mechanical means, or by some other pressure than that due to its own expansion. Thus, in his argu-



ment accompanying the amendment, dated September 1, 1898, the patentee states:

"with the references the heating of the blank is performed for the purpose of making it plastic, so that the material of the blank may be afterwards displaced and caused to engage the mold by the action of a mandrel, while *with the Edison process the heating of the blank is performed solely for the purpose of causing it to expand into engagement with the matrix or mold.*" (The italics are my own.)

Q. 8. Is it your understanding that this Edison patent contemplates the possibility of making satisfactory reproductions of phonograms without expanding the blank or forcing it into contact with the matrix in any other way, or by any other means than by its own expansive action, due to a heating of the blank alone, or of the blank and matrix?

A. That is exactly my understanding of the Edison specification, which states, as has been pointed out, that the expansion of the blank by heat alone will bring it into such intimate contact with the record surface of the matrix or mold that "the negative surface thereof will be impressed with absolute accuracy upon the surface of the blank." The first and fourteenth claims of the patent are particularly directed, apparently, to this possibility of the process, and in the affidavit of Charles N. Wurth, an assistant of the patentee, employed in his laboratory in the experimental work connected with this process, this affidavit having been filed with the amendment of September 1, 1898, it is stated that:

"I have made many records wherein the expansion of the mold was alone depended upon to secure the impression."

September 1,

And it is further stated at the end of the same affidavit that:

"The test of the difference between the two comparing with one of the prior art processes is that with the Edison process it is possible to effect a satisfactory, though not loud reproduction of the record by the use of heat alone, the expansion being sufficient to cause the blank to engage the record and result in an impression."

Q. 9. What, then, do you understand to be the object of the further expanding of the blank by the forcing in of the tapering mandrel?

A. The specification states that the forcing of the tapered mandrel into the blank, after the latter has been expanded into engagement with the record by heat, is to "facilitate the operation and make the resulting duplicate record somewhat sharper." (Lines 41-43, page 2.) And the affidavit of Mr. Wurth, to which I have above called attention, points out that superior results are obtained in this manner. To quote the whole of his statement first above mentioned:

"I have made many records wherein the expansion of the mold was alone depended upon to secure the impression, but it is better to use a tapering mandrel, as Mr. Edison describes in his application, as by that use the resulting duplicates are perceptibly better than those obtained by the action of expansion alone."

The fact appears to be that the patentee contemplated the printing of the duplicate record surface primarily by the expansion due to the heating of the blank, and secondarily, and as a further improvement tending towards more perfect results, by the expansion due to the tapered mandrel. In his argument, dated September 1, 1898, above referred to, Edison states that he

"uses in his preferred process two distinct expanding



steps, one the result of heat and the other of mechanical pressure."

Q. 10. I note that certain of the claims of the Edison patent sued upon refer to the softening of the blank by heat. What foundation for this softening operation do you find in the application for his patent as originally filed?

A. Edison's original application affords no support whatever for this statement, beyond the fact that it describes the blank as being heated to cause it to expand against the matrix. And, as above pointed out, the patentee, in his arguments and affidavits before the Patent Office, strenuously disclaims any other effect of the heating operation employed by him than that of causing the blank to expand, and insisted that his process was thereby distinguished from those processes of the prior art in which the blank was heated for the purpose of softening it. The degree of heat mentioned in the Wurth affidavit as employed in the Edison process, to-wit, 115°, is not high enough to soften ebonite, hard rubber, or celluloid in the least. As to the other materials mentioned in the Edison specification, to-wit, asphalt, stearic acid or stearate of soda, mixed with varying proportions of fine precipitates, such as chalk, slake lime, or lamp-black, or waxes or resins, such as sealing wax or shellac, mixed with fine precipitates, the description is too indefinite to enable any exact statement of their softening points to be made, and with regard to these I can only accept the patentee's argument and affidavits, to the effect that the blank was not softened or rendered plastic by the degree of heat applied. The hard soap records placed on the market by the complainant company under its Edison patents are not perceptibly softened, except by a temperature

nearly or quite double that mentioned by Wurth as employed in the process of the patent in suit.

Q. 11. Please now briefly describe the prior state of the art at the date of Edison's application, and particularly those prior patents which you have stated were cited by the Patent Office against Edison's claims, and from which he attempted to differentiate, as above pointed out.

A. The patents of the prior art cited by the Patent Office against the application which resulted in the Edison patent sued upon are as follows:

U. S. patent to Edison, 484,582, October 18, 1892;

U. S. patent to Edison 526,147, September 18, 1894; and

English patent to Lioret, No. 23,366, of 1893; and

English patent to Young, No. 1,478, of 1894.

Of these patents Nos. 484,582 and 526,147 are of interest only in showing that Edison's preferred process of making the matrix was patented by him more than two years prior to the date of his application for the patent in suit, and as showing also that the same identical matrix employed in the patent in suit was disclosed by him at the same early date. It is true that patent No. 484,582, which discloses the same matrix, formed in the same manner, contemplates the subsequent splitting of the matrix thus formed by a thin saw, so as to make it separable, but obviously the matrix before being split is the identical matrix which the patent in suit describes.

It is, therefore, apparent that no novelty in the process of the patent in suit can be predicated upon the method employed for forming the matrix, and in so far as this method is detailed as a step in the patented process, it is surplusage which might better be omitted. And this not only because of its lack of novelty, but because, as the



specification itself points out, the matrix may be equally well made in any manner known to those skilled in the art, it being obvious that the particular method employed for making the matrix cannot possibly affect in any way the steps subsequently required for the formation of a duplicate record within such matrix.

Adjourned till Tuesday, January 26, at 10 o'clock

A. M.

Chicago, January 26, 1904. Parties met pursuant to adjournment. Present as before.

Witness Carter continues.

The British patents to Lioret and to Young also show that it was old, more than two years prior to the filing of the application for the Edison patent in suit, to make matrices substantially identical with the matrix of the patent in suit, for the purpose of enabling duplicate records to be formed therein. In the Lioret patent the matrix is described as a "galvano-plastic" mold. In the Young patent the matrix is more specifically described as made by coating the original wax record with plumbago, or other conducting material, and then depositing copper or other metal upon the coated surface by an electrical plating bath. This is, however, merely a longer way of describing what Lioret calls a galvano-plastic mold. The process employed in both cases is the well-known electrotyping process referred to in the patent in suit as one method which may be employed to produce the matrix, it being the same, in fact, which defendant employs in making its matrices, as will later appear.

The British patents, however, are particularly noticeable in that they also disclose, in my judgment, the complete process of the patent in suit, except, possibly, as this pro-

cess may be regarded as limited to the impressing of a *plastic record against a suitable matrix by its own expansive force*. In both British patents the object of the process disclosed is the same as that of the Edison process, to-wit, the indefinite reproduction of phonographic records in exact duplicate of an original record. In both the British patents a cylindric matrix is employed, having upon its bore the negative duplicate in relief of the original record thread or line, just as in the Edison patent in suit. In both British patents a hollow cylinder or sleeve of celluloid, approximately fitting the bore of the matrix, is inserted therein and subjected to heat and pressure to cause it to take the imprint of the record line on the surface of the bore, as in the patent in suit; and in both British patents the celluloid sleeve or blank is finally cooled to free it from the mold or matrix and enable it to be moved endwise therefrom.

Lioret's description of these duplicate records and the manner in which he makes them is as follows (lines 9-25, p. 7):

"They may be made of celluloid; this material presents the advantage of keeping impressions well, of not being liable to break, and above all of not being materially affected by atmospheric variations.

"Furthermore, although very homogeneous and hard, it cuts and molds sharply and wears away very slowly.

"The following is the method of operation: The matrix cylinder *a* (Fig. 4) is prepared as I have above indicated, then, as shown in Fig. 5, I take a galvano-plastic mold *a'*, which consequently presents the form of a tube bearing on its inner surface the counterpart of the screw-thread and of the impressions of the matrix cylinder *a* (Fig. 6). Then into this tube is introduced a celluloid sleeve *c* (Fig. 7) just big enough to enter same freely, and the whole is plunged



into warm water; the celluloid then softens and a mandrel  $a^2$  sufficiently large to expand it and cause the material to penetrate into the hollows of the tube is forced therein (Fig 8). It is then plunged into cold water, and the celluloid again hardens, at the same time contracting sufficiently to enable the sleeve  $c$  to be easily withdrawn from the tube  $a^1$ . This sleeve thus finally becomes a reproduction cylinder  $c$ , which is the exact reproduction of the matrix cylinder  $a$ ."

Now, bearing in mind that the "matrix cylinder" of this quotation, is simply the original cylindric record or phonogram, about which the matrix or mold is formed, and bearing in mind also that the mandrel referred to is shown in Lioret's drawings (Fig. 8) as a tapered mandrel, it will be noted that the quotation is about as accurate a description of the Edison patent in suit as it is possible to frame, omitting Edison's reference to the impressing of the blank against the matrix by its own expansive force, and to the use of hot air, instead of hot water, as his heating medium.

The Young patent, after describing in detail the method of forming a matrix (which he calls an "electro") by electrotyping an original wax record cylinder engraved with the recording stylus in the usual way, proceeds as follows:

"To produce a working record from the said electro; this and its case would be warmed or slightly heated by any convenient means, and within the said electro would then be placed a very thin hollow cylinder, of the same size externally as that of the original wax cylinder from which the record was first taken. The said thin cylinder may be made of any suitable material capable of being rendered plastic by the application of a gentle heat, such, for instance, as celluloid, xylonite, vulcanite, or the like, and having a highly polished or perfectly smooth



external surface, and when this has been rendered pliable, by a gentle heat (which may be that given off from the heated electro and its casing) I press the same gently and evenly up to and against the face of the electro, and take an exact impression therefrom, and when the said plastic cylinder has cooled, I am enabled, by slightly collapsing this inwardly, to cleanly and easily remove it from the electro, when I am in possession of an exact duplicate of the original record and all its delicate details, which I then mount upon the same or a like base as that from which the original record was removed, and the same may then be placed upon the machine and used for reproducing in the same manner as could and would have been the original wax record."

This also will be recognized as a substantially accurate description of the Edison process, omitting the reference to the impressing of the blank against the matrix by its own expansive force. The quotation does not use the words "shrinkage" or "shrinking," but speaks of cooling the blank and collapsing it inwardly to release it from the mold, and it is evident that the collapsing referred to is simply a clumsy statement of the contradiction which necessarily results from the cooling of the celluloid and inevitably draws it inwardly away from the surface of the bore of the matrix, so that it can be removed endwise therefrom.

Adjourned till Wednesday, January 27, 1904, at 10 o'clock A. M.

Chicago, January 27. Parties met pursuant to adjournment. Present as before.

Q. 12. Do I understand that these British patents to Young and Lioret, are the prior patents from which the patentee attempted to differentiate by argument and affidavit while his application was pending? If so, will you



kindly explain more fully the nature of the distinctions which the patentee asserted to exist between his process and the processes disclosed in these British patents.

A. These are the same prior patents discussed in the arguments and affidavits referred to. In distinguishing from these patents, Edison first alleged, as has been before stated, that in these British patents the heating of the blank is effected solely for the purpose of softening it; while in his process the heating of the blank is solely for the purpose of causing it to expand against the mold. This is repeated over and over in most emphatic language, to some of which reference has already been made. Thus, in the argument dated July 6, 1898, it is stated that—

“The heating of the blank as described by Lioret is effected solely for the purpose of making it soft in order that the mass may be *displaced*, so to speak, and be forced into the record contained at the bottom of the groove in the mold. With applicant's process, the blank is heated for the sole purpose of causing it to expand and engage tightly with the record formed in the mold. Since perfect cylindrical molds and blanks are used, the latter may be fitted within the mold within .002 [two one-thousandths] of an inch, so that the proper expansion of the blank may be secured *without appreciably affecting the hardness and brittleness thereof.*” (These latter italics are my own.)

Also that—

“The second British patent [the Young Patent] makes it very clear that in the process described thereby, as well as in that invented by Lioret, the heating of the blank is performed solely for the purpose of making it plastic.”

And finally, that—

“It being the fact, therefore, that in neither of the references to which the Examiner directs applicant's

attention is the heating of the blank effected for the purpose of expanding the blank into contact with the record, but is done solely for the purpose of making the blank plastic to enable it to be displaced and forced into contact with the record, it is clear to applicant that neither of the references is an anticipation of his invention."

Also quoting further from the Wurth affidavit, accompanying Edison's amendment of September 1, 1898:

"In carrying out the Edison process, I usually heat the blank after it has been inserted in the mold to a temperature of about 115 degrees Fahrenheit, but this, of course, depends largely upon the character of the material of which the blank is made. *This heating does not in any way affect the brittleness of the blank, nor does it make the blank plastic.*" (These italics are my own.)

And again—

"I have found that it is impracticable to heat a blank to the plastic point after its introduction into the mold, and particularly if the record is deep, as is obviously the case with a mold of the Lioret type having a record formed at the bottom of screw-threads, for the reason that when heated to plasticity, the blank will inevitably stick to the mold and it will in consequence be impossible to obtain a perfect record. When, on the contrary, the blank is heated well below the point of plasticity, as in the Edison process, and does not lose its friability, no difficulty of this kind has ever arisen."

And again—

"The Young patent does not state how the blank is to be engaged with the mold, but assuming that it could be evenly, accurately and simultaneously engaged with all parts of the record, it would be possible to obtain a duplicate as described. It would not, however, be possible to remove the duplicate after it was obtained, since the heating of the blank to the



point of plasticity would inevitably cause it to stick to the mold and thereby injure the record in whole or part."

And finally—

"The essential difference between the Lioret and Young processes and the Edison process is that in the former the heating is effected for the purpose of making the blank plastic, so as to allow the material thereof to be distorted or displaced by the introduction of the mandrel. *With the Edison process*, the heating is done for the purpose of expanding the blank into engagement with the record, *and does not affect the brittleness of the blank*. The test of the difference between the two is that with the Edison process it is possible to effect a satisfactory, though not loud, reproduction of the record by the use of the heat alone, the expansion being sufficient to cause the blank to engage the record and result in an impression. With the Lioret and Young processes, this would not be possible, since the heating is always a necessary precedent to the subsequent displacement of the material by the use of a mandrel." (The italics are my own.)

Mr. Edison himself also executed an affidavit on the same date as the Wurth affidavit, and which was filed with the same amendment of September 1, 1898. In this affidavit he says:

"I have read the affidavit signed and executed by my assistant, Mr. Charles N. Wurth, on even date herewith. The statements made by Mr. Wurth in reference to his experiments connected with my process and his criticisms of the processes described in the Lioret and Young patents are true, to the best of my knowledge and belief."

And quoting also from the amendment accompanying these two affidavits—

"The Lioret and Young processes are different from that which Mr. Edison has invented, and par-



V. Carter.

Deposition of Henry W. Carter.

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ticularly in the respect that with the references the heating of the blank is performed for the purpose of making it plastic so that the material of the blank may be afterwards displaced and caused to engage the mold by the action of a mandrel, while with the Edison process the heating of the blank is performed *solely for the purpose of causing it to expand into engagement with the matrix or mold.*" (The italics are my own.)

And again—

"The claims which have been erased are cancelled in view of the fact that they appear to cover processes which are broader than applicant's invention, namely, processes wherein the blank, in the process of duplication is displaced instead of being expanded. Neither the present first nor second claims is met by the references, *for the reason that in the references the blank is not engaged with the mold by a change in temperature.* In both the references, the heating of the blank is, as stated, performed for the purpose of making the blank plastic, and the engagement is subsequently effected by mechanical means." (The italics are my own.)

Again in the argument accompanying the amendment of September 7, 1899, it is stated that—

"It is to be noted that they [the Young and Lioret patents] do not meet the terms of the rejected claims, since with both references the blanks are heated to the point of plasticity, and the engagement with the mold is effected by actually displacing the material of which the blank is formed. *This is not the equivalent* of applicant's step of expanding the blank into engagement with the mold, the blank being heated below the point of plasticity *necessarily*, because otherwise it would stick to the mold and would destroy the record if an attempt were made to withdraw it." (The italics are my own.)

These quotations from the file-wrapper of the Edison patent show the gist of the inventor's argument as to the



difference between heating the blank to soften it, with a view to subsequently forcing the softened material against the record surface of the bore of the matrix, as in the Lioret and Young processes, and heating the blank to a degree insufficient to soften it, or to appreciably affect its hardness or brittleness, but enough to cause it to intimately engage the bore of the matrix by its own expansive force. At this time the patentee was evidently laboring under the impression that the heating of the blank until softened so that it would take the impression of the bore when subsequently forced out against it, as in the Lioret and Young processes, would cause it to stick to the surface of the bore so as to prevent its removal without damaging the record. And this may have been true with the soap or wax records, with which alone Edison appears to have been familiar at the date of his application. But it was not true with celluloid records, such as those of the Young and Lioret patents, and such as those manufactured by defendant, as will presently appear. The fact appears to have been that Edison had never made a celluloid record when he applied for the patent in suit. His testimony in the interference *Lambert vs. Edison*, a copy of the record in which has been filed in this case by complainant, is to the effect that he first made a celluloid record in the year 1899. This testimony, dated February 21, 1901, is as follows:

"25 X-Q. Did you ever make any celluloid records, Mr. Edison?

"A. I have lately.

"26 X-Q. When did you first make a celluloid record?

"A. I don't remember; I think, perhaps, about a year or a year and a half ago." (Edison's Record, p. 9.)



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This would bring his first making of a celluloid record at least a year later than the date of filing of his application for the patent in suit, and evidently at that filing date he knew nothing of celluloid records or their characteristics, or the manner in which celluloid would act under the circumstances of a process such as Lioret or Young describes. His naming of celluloid in his specification as one of the materials which might be employed in his process was thus manifestly simply a blind attempt to extend the scope of his alleged invention to include materials of the adaptability of which to his process he had no knowledge, and which have subsequently been proved to be incapable of working in accordance with the process which he at that time disclosed. For the fact is, as will subsequently be shown, that celluloid is incapable of being impressed with the record surface of the bore of the matrix unless first softened or rendered plastic after some such manner as that described in the Lioret and Young patents, and unless forced out against the bore of the matrix a high degree of pressure applied independently of and in addition to any pressure which may result from the force of its own expansion. And the fact is, further, that when so softened or rendered plastic and forced out against the bore of the matrix, the celluloid will not stick to the surface of the bore, but will inevitably cleave away from it by its own natural shrinkage when cooled, and this no matter how thin the sheet of celluloid may be of which the cylindric phonogram blank is composed.

In addition to distinguishing his process from the Lioret and Young patents by the difference in the character of the heating and in the effect of the heating upon the blank, the patentee also contends in these same argu-



ments and affidavits that the Lioret process is inoperative because of the impossibility of separating the galvanoplastic mold or matrix from the original record cylinder used by Lioret, and because the immersion of the mold and blank in hot water to soften the celluloid would cause the water to penetrate between the mold and blank, where it could not be displaced by the driving in of the mandrel, and where it would consequently prevent the formation of a perfect imprint of the record indentations. Also that the process of the Young patent contemplates a collapsing of the record cylinder, whereby its cylindric shape would be destroyed, so that it could not be restored without damaging the record irreparably.

And subsequently it was contended that the Edison process was distinguished from the Lioret process, in that in the latter the printed blank required to be unscrewed from the mold after cooling and contracting, whereas the Edison blank could be removed "by direct longitudinal movement," and was distinguished from the Young process in that the printed record, was contracted away from the matrix by its own shrinkage, due to cooling, instead of by being collapsed. Also that the Edison process was distinguished from the Young process in employing a blank "sufficiently thick to maintain its shape during and after the act of disengagement from the matrix." And all of these distinctions have been embodied in the claims of the patent in suit, to a greater or less extent, as will appear from an examination of the claims sued on.

Q. 13. Please state to what extent these distinctions, contended for by the patentee as differentiating his process from the Lioret and Young patents are material and valid.

A. As to the first distinction, so strenuously insisted



Henry W. Carter.

Lioret process is inoperative of separating the galvanoplastic from the original record cylinder. The immersion of the mold in the celluloid would cause the mold and blank, whereby the driving in of the mandrel would prevent the formation of record indentations. Also that it contemplates a collapsing by its cylindric shape would not be restored without help.

contended that the Edison process, in that it required to be unscrewed and contracting, whereas the Lioret "by direct longitudinal" is pushed from the Young process, was contracted away from the matrix, instead of the Edison process was expanded in employing a process to maintain its shape during and after it from the matrix." And it has been embodied in the claims of the Edison process, in whole or less extent, as well as in the claims sued on.

At least these distinctions are as differentiating his process as the patents are material and

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upon, that the heating of the blank in the Edison process does not soften the blank or materially affect its hardness, brittleness, or friability, but operates solely to cause the blank to take the impression of the mold "by its own expansive force," whereas the heating contemplated by the Lioret and Young patent operates solely to soften the blank and render it plastic so that it will readily conform to the record surface of the mold when subsequently forced against it by pressure otherwise applied, I have no criticism to offer. It is obvious that a celluloid record could not be "printed," to use the trade term, unless it was so softened, and that neither the Lioret nor Young patents contemplates a process in which such softening does not occur. A wax or soap record may perhaps be printed without softening it and by its own expansive force, and in this respect the Edison process appears to be possibly distinguished from the processes of Lioret and Young, as the patentee contends.

The objection that the Lioret process is inoperative because of the alleged difficulty of separating the galvanoplastic mold is perhaps best stated in the words of Mr. Wurth's affidavit:

"In the Lioret process as described by the inventor, an original record is first taken on a soft steel cylinder, the record being cut on the top of a screw-thread formed in the periphery of the cylinder. It is possible to do this, as I have made such records myself. The original record thus obtained by Lioret is then electro-plated, the electroplating being sufficient to form a mold of the desired body, no backing, so-called, being described by him. This is, of course, possible. The patentee then says (p. 2, lines 92 *et seq.*):

"I remove this tube from the matrix cylinder by first heating it externally to expand it suf-



ficiently to enable it to be unscrewed from the said cylinder, the impression being so slight that very little expansion is necessary.'

"In my opinion, this could not be done. I doubt, in the first place, if an electrically plated coating could be separated from a mold even if the expansion were sufficient, owing to the adhesion between the coating and mold. In the second place, I do not consider it possible to separate two molds thus united together by applying heat to them, owing to the practically constant co-efficient of expansion of all metals. Considering the original record to have a diameter of approximately two inches, then by subjecting the metal to as great a variation as 180 degrees, the diametric expansion of the mold relatively to the record would not be greater than .0015 of an inch, considering the record to be a steel cylinder and the plating to be of copper. A difference in the diametrical expansion .001 or even .003 of an inch would not be sufficient, since I have found that with ordinary records there should be an expansion of at least .005 inch in order that in separating a duplicate from the mold the record in relief may not be injured. At the outset, therefore, I believe Lioret would find it difficult, if not impossible, to separate the original record from the mold plated thereon."

Obviously the objection thus stated is purely academic and analogous to the equally unfounded statement that celluloid, if heated until softened, would stick to the surface of the matrix. Wurth states that it is possible to make steel record cylinders as Lioret describes "as I have made such records myself." Also that it is possible to form a galvano-plastic mold upon the steel record cylinder thus made. The only point to which he takes exception is, that the mold can be separated from the cylinder without damaging the record, and as to this he is merely in doubt, believing it to be "difficult, if not impossible," because if subjected to a temperature difference of 180°

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the difference in expansion in a two-inch cylinder would be less, in his judgment, than that required to prevent injury to the record. But there is no reason why the temperature difference should be limited to 180°, or even to twice that amount, for the melting point of both steel and copper is measured by thousands of degrees, and by judiciously applying a flame to the exterior of the mold while running cold water through the interior of the record cylinder, if necessary, the temperature difference could be made almost anything desired. Moreover, phonographic record cylinders are commonly made which are nearly five inches in diameter, in which case the difference in expansion, due to any given difference in temperature, would be nearly two and a half times the amount which would occur in a two-inch cylinder. So that by Mr. Wurth's own showing the necessary difference in expansion could be obtained, with the larger sized commercial records, at last, by subjecting the record cylinder and the mold to different temperatures well within the limits of feasible practice. And in my own judgment it would be perfectly practicable to separate the mold from a two-inch cylinder as well. Any tendency for the metals to adhere to each other could be readily overcome by applying a suitable coating to the cylinder before electro-plating it, in accordance with the familiar practice of the electro-plating art. Moreover, it would obviously be possible to dissolve out the original steel record from the galvano-plastic mold by the use of appropriate acids, which would attack the steel alone, leaving the copper unharmed, in exactly the same manner as the original wax record is dissolved out of the mold of the Young patent, or of the Edison patent of October 18, 1892. So that from any point of view the objection to the Lioret process, on account of



any difficulty of obtaining the desired mold, cannot be sustained.

Adjourned till Thursday, January 28, 1904, at 10 o'clock A. M.

Chicago, January 28, 1904. Parties met pursuant to adjournment. Present as before.

Witness Carter continues.

To the objection that the dipping of Lioret's mold and celluloid blank into hot water would render the process inoperative, by permitting water to penetrate between the mold and the blank, where it might fail to be expelled by the subsequently applied pressure, and where it might interfere with the formation of a perfect imprint on the blank, I have only to reply that it would be a simple-minded mechanic indeed to whom, if he found any difficulty of this kind, it would not instantly occur to temporarily seal the joint between the ends of the mold and the matrix, as by a suitable insoluble wax, so as to prevent the water from entering the crevice. A more obvious expedient, in fact, can hardly be conceived of, or one more certain to overcome a suggested difficulty.

The objection to the Young patent, that it contemplates and requires such a collapsing of the record as would destroy its shape and render the impression liable to be damaged, is founded, as I believe, upon a misinterpretation of the term "collapsing" used in the Young patent, and is contradicted by the natural law governing the action of the material composing the record cylinder, when subjected to the cooling which the patent described. The patentee's interpretation of the term "collapsing," as evidenced by the amendments and arguments referred to, and the complainant's similar interpretation of the term,

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as indicated by the deposition of its expert, Mr. Frank Dyer, appears to be synonymous with "buckling," and seems to contemplate the folding in of one side of the cylinder for the purpose of enabling it to be stripped from the surface of the bore of the matrix. In his deposition, Mr. Frank Dyer describes the Young patent as one—

"wherein duplicates were formed on very *thin walled cylinders which could not be contracted*, as with the invention of the patent in suit, but which required to be removed by collapsing them so as to change their shape and effect a separation of the engaged surfaces." (The italics are my own.)

Now, considering the nature of the material of which these thin-walled cylinders were composed in the Young patent, to-wit, celluloid, this statement that they could not be contracted is not only a perfect absurdity, but it is the exact contrary of what must inevitably occur when such cylinders are cooled as the patent describes. For, as I have already pointed out, the fact is that no power on earth could prevent these celluloid cylinders from contracting away from the surface of the mold when subjected to cooling and when the expanding pressure upon them is released. This action necessarily results from the greater co-efficient of expansion and contraction of celluloid, as compared with the metal of which the matrix is composed, and will result in the same way whether the celluloid cylinder be thick or thin. In fact, the action with a thin walled cylinder is even more noticeable than with a thick cylinder, because it occurs much more rapidly by reason of the greater rapidity with which the thin walled cylinder gives up its heat when subjected to a cooling influence. The theory, suggested in the patentee's arguments before the Patent Office, that there is an ad-



hesive attraction between the surface of the metal mold and the surface of the celluloid record, is a myth which has not the slightest foundation in fact, as I have heretofore pointed out. This is *conclusively demonstrated in the very process carried out by defendant in making its celluloid records, and of which this complainant complains.* And I have demonstrated it myself beyond a peradventure by experiments carried on for that purpose.

As showing this, I here produce four exceedingly thin walled celluloid cylinders made in my presence and under my direction by the same process employed by defendant in making its regular commercial records. These cylinders are made of celluloid not thicker than a great deal of ordinary correspondence paper, such as business letter-heads are frequently printed on, so thin, in fact, that it could not be obtained in tubular form, the cylinders having been made of sheet celluloid folded into cylindric shape and with the edges overlapped and cemented to complete the cylindric form. These cylinders, which I shall hereafter refer to as Young patent Records Nos. 1, 2, 3 and 4, have all been expanded by internal pressure into intimate contact with the bore of a phonographic matrix made in substantially the identical manner described by Young, after being first heated so as to soften the celluloid and render it sufficiently plastic to take the impression of the matrix. And in every case, upon then being allowed to cool, the cylinder contracted, collapsed, shrunk, or whatever it may be called, so as to free itself from engagement with the bore of the matrix. This collapsing or shrinkage occurred solely as a result of the cooling of the blank and without any action or volition on my part, or on the part of any other person present at the time. And it occurred without in any way changing

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the essential cylindric shape of the blank. There was no buckling or bending of the blank whatever. It simply freed itself from the matrix by its own shrinkage, due to its cooling off, and the separation was so complete within a very short period—in some cases but a few seconds—that the cylinder, light as it is, dropped from the matrix by its own weight when I tapped it lightly on the end with a lead pencil. I repeat that there was no collapsing or buckling whatever of the blank, except its natural contraction or shrinkage, due to cooling. The perfect cylindric shape of the blank, marred only by the joint at the meeting edges of the celluloid, was maintained throughout the operation. It was not pried out, or its removal assisted in any way beyond the slightest tapping on the end of the cylinder with a lead pencil, which was the only instrument used in this connection, and it is unquestionable but that if given further time to cool the blank or celluloid cylinder thus treated would have further contracted so as to have dropped out of the matrix by its own weight without being even tapped with the pencil. These experiments were carried on in the presence of Mr. P. C. Dyrenforth, of counsel for complainant, and the process employed was substantially that regularly employed by defendant in the making of its commercial records. The heating medium employed for softening the celluloid was steam at a pressure of thirty or forty pounds to the square inch, and the ultimate expanding pressure was given the blank by introducing compressed air under pressure of about eighty pounds per square inch. There was no visible or detectable tendency for the surface of the thin celluloid cylinder to adhere to the surface of the matrix, and the action of the cylinder in every respect was substantially the same as the action of the thicker, though still comparatively thin cyl-



inders, of celluloid used by defendant for its commercial records.

In my judgment, therefore, there is no other reasonable conclusion to be drawn than that the collapsing referred to in the Young patent means this inevitable shrinkage which necessarily results from the cooling of a celluloid cylinder, whether thick or thin, and which inevitably acts to draw it inwardly away from the bore of a surrounding metallic matrix and to free it therefrom, by reason of the fact that the celluloid contracts more rapidly than the metal does. Mr. Frank Dyer's (complainant's expert) statement that very thin walled cylinders, such as the Young patent mentions "could not be contracted," is not true, either in theory or fact, and no distinction between the process of the Young patent and that of the patent in suit, based upon any such statement or allegation can be given any weight whatever.

BY MR. SHERIDAN: The thin walled celluloid cylinders thus referred to and produced by the witness are offered in evidence as "Defendant's Exhibit Young Patent Record No. 1," "Defendant's Exhibit Young Patent Record No. 2," "Defendant's Exhibit Young Patent Record No. 3," and "Defendant's Exhibit Young Patent Record No. 4," respectively, and the notary is requested to mark the same accordingly.

Q. 14. Do these thin walled exhibit cylinders constitute commercially practicable records?

A. They do not. They are made too crudely, and the cheap celluloid of which they are formed is so thin that they will not hold their shape. Moreover, it is too thin to enable a sufficient flange to be turned in at each end of the cylinder to properly engage the mandrel of the

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phonogram. Moreover, the joint at the meeting edges of the celluloid sheet is imperfect and is so rough that it prevented a perfect reproduction of the record line of the matrix along the joint, except possibly in the case of "Young Patent Record No. 2," which is fairly well printed throughout and which I have found to give very fair results when subjected to the reproducing style of a phonograph.

Q. 15. I note that the thin cylinder, "Defendant's Exhibit Young Patent Record No. 4" is not provided with end flanges. Was this exhibit printed in the same manner as Nos. 1, 2 and 3?

A. Not quite, although the process employed was essentially the same. In order to better show how very thin these cylinders really are, I wished to print one of them without first turning in its ends to form flanges, as was done with Nos. 1, 2 and 3. The object of these flanges was to engage the top and bottom plates so as to form a seal sufficient to prevent the escape of the steam and air when admitted to the interior of the cylinder. And in the absence of any such flange on "Exhibit No. 4," I simply took an ordinary blank, such as is used for defendant's commercial records, slipped the plain cylinder of Exhibit No. 4 over it, and inserted both in the matrix, using the inner cylinder as an expansible bag, as it were, to confine the pressure which was being applied to the thin cylinder to force it against the matrix. This was the best means I had on hand at the time of printing such a thin cylinder without first turning in its ends to form flanges, and the interior flanged cylinder served, in effect, as the rubber-covered fluid pressure expander shown in Fig. 8<sup>a</sup> of the British patent to Lioret. The only difference was that in the case in hand the inner celluloid cylin-



der could not subsequently be sufficiently contracted to enable the thin cylinder "Young Patent Record No. 4" to be easily removed therefrom. Both being of celluloid, they both contracted together away from the matrix, and readily dropped out of the latter, as did Nos. 1, 2 and 3, but their contraction, being equal, had no tendency to separate them from each other, and I was obliged to cut off the ends of the inner cylinder and run a knife blade between them in order to remove the exhibit.

Q. 16. What force do you find in the attempt to distinguish the Edison process of the patent in suit from that of the Lioret patent, by reason of the alleged fact that the printed blank cannot be removed from the Lioret matrix "by direct longitudinal movement"?

A. None whatever. This fact, if true, is only an incidental result of the using the particular kind of matrix described by Lioret, to-wit, one formed about a threaded original record cylinder, as distinguished from one formed about the ordinary form of original wax record, which is smooth and cylindric, except for its record line. And this matter of the exact character of the matrix used is obviously quite apart from the essential steps of the process of subsequently forming a duplicate record within the matrix. In both cases the matrix has a substantially cylindric bore provided on its inner surface with a reverse duplicate of the record line or indentations constituting the original record. In both, a substantially cylindric blank of impressionable material is fitted within the bore of the matrix. In both, this cylindric blank is softened by heating, unless we accept the patentee's—Edison's—early contention, to the effect that his blank is heated only to expand it, and is not heated sufficiently to affect its hardness. In both, the blank is subsequently expanded

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to force it into intimate contact with the bore of the rec-  
ord cylinder and cause it to take an exact imprint of the  
record line thereon; and in both the printed blank is sub-  
sequently contracted by cooling "sufficiently to enable the  
sleeve *c* (blank) to be easily withdrawn from the tube *a*  
(matrix). Obviously, therefore, the actual process of  
making the duplicate record is substantially the same in  
both cases, notwithstanding the specific differences in the  
interior surfaces of the matrices and the fact that the  
particular matrix employed by Lioret has a definite screw-  
thread on its interior of such depth that the corresponding  
thread printed on the blank may not entirely be disengaged  
from it by the contradiction due to the cooling of the blank.  
The object of the contraction in both cases is the same,  
*i. e.*, to completely disengage the record indentations  
printed in the duplicate record from the relief record on  
the interior of the bore of the matrix. And in both cases  
it has exactly this result, notwithstanding that the screw-  
thread feature of the matrix in the one case may possibly  
require the withdrawal of the printed blank by unscrew-  
ing it, whereas in the other case it can be withdrawn by  
direct longitudinal movement.

But it does not by any means follow that the duplicate  
record may not be withdrawn from the Lioret matrix, in  
many cases at least, "by direct longitudinal movement,"  
notwithstanding the presence of the screw-threads. It is  
entirely a matter of the diameter of the record and the  
depth of the screw-threads. Lioret's British patent, it  
will be noted, says nothing about any necessity of un-  
screwing the record. It simply says that the matrix con-  
taining the expanded blank

"is then plunged into cold water, and the celluloid  
again hardened, at the same time contracting suf-



ficiently to enable the sleeve *c* [the celluloid record] to be easily withdrawn from the tube *a*."

The assumption that an unscrewing of the celluloid record is a necessity, appears to be predicated upon certain statements in the U. S. patent to Lioret No. 528,273, of October 30, 1894. But this same U. S. patent points out that

"the threads of the matrix are very fine in practice and are very much exaggerated in the drawing to facilitate the illustration" (lines 124-127, p. 2).

And it will be evident that with a fine thread and a record cylinder of considerable diameter, the contraction of the celluloid record might easily be enough to not only release the record indentations from the matrix, but the screw-thread as well. For example, I here produce a commercial celluloid record, manufactured by the defendant company and entitled "Lost Chord, Song." And I also produce the matrix in which this identical record was formed under the process practiced by defendant. And it will be noted that the diameter of the celluloid record is considerably less than the diameter of the bore of the matrix. It is something more than a sixteenth of an inch less, as near as I have been able to measure it, so that, had this matrix been made after the fashion of the Lioret matrix upon an original record having a thread cut in it, the contraction of the celluloid blank would nevertheless have been sufficient to entirely clear, not only the record indentations, but the spiral threads as well, providing these threads were "very fine," as the Lioret patent states they are in practice, as above quoted. True, the depth of the thread in this case could not have been greater than a sixty-fourth of an inch, but threads of no greater depth than this are perfectly practicable and are frequently em-

ployed in mechanics, and it will be remembered that a sixty-fourth of an inch is an enormous depth, as compared with the depth of the indentations of an ordinary phonographic record, which can only be measured in ten-thousandths of an inch.

I wish further to state in this connection that in my judgment it is quite immaterial how or in what manner Lioret proposed to obtain his matrix or mold, whether from a screw-threaded original cylinder or not. For the common wax or soap records were well known at this time, being an ordinary article of commerce, and the method of making matrices or molds from these records had already been disclosed in the Edison 1892 patent, if indeed, it could not be said to have been known as a matter of common knowledge with mechanics familiar with the electrotyping process. It was, consequently, open to Lioret, or to anyone reading the Lioret patent, to employ wax originals, and matrices used from these wax originals, if so desired, instead of employing threaded steel originals and matrices made therefrom. And there is nothing, in my judgment, about the Lioret process of subsequently forming celluloid duplicates within a substantially cylindric matrix, which necessarily limits the process to the use of a matrix made from screw-threaded steel records, or to any other particular matrices. With any matrix, and especially with a matrix formed under and in accordance with the Edison 1892 patent, the Lioret process would obviously produce a duplicate of the original record in exactly the same manner and with equally as perfect results, as though a matrix made from Lioret's threaded steel cylinder had been employed.

BY MR. SHERIDAN: The celluloid record "Lost



Chord, Song," and the matrix identified therewith by the witness, are here offered in evidence as "Defendant's Exhibit Lost Chord Record and Matrix."

Adjourned till Friday, February 5, 1904, at 10 o'clock A. M.

Chicago, February 5, 1904. Parties met pursuant to adjournment. Present as before.

Examination of witness Carter continued.

Q. 17. In your judgment, of what force is the contention that the Edison process of the patent sued upon is distinguished from the prior art processes of making celluloid phonographic records, in that Edison uses a blank "sufficiently thick to maintain its shape during and after the act of disengagement from the matrix"?

A. This distinction obviously obtains, if at all, only as to the Young patent. The blank employed by Lioret is evidently just as thick as the blank employed by Edison. Lioret does not mention this matter of the thickness of the blank, but neither did Edison in his original specification. In both cases the fact of the blank's being thick enough "to maintain its shape during and after the act of disengagement from the matrix" must be predicated on the drawings alone. The first mention of it in the Edison specification was in an amendment dated March 20, 1900, more than two years after Edison's application was filed. This amendment is stated to have been made because and in view of the grant of the Lambert patent No. 645,920, of March 20, 1900, in which patent the same phraseology is employed. Evidently, however, the record which the patentee Edison had in mind and particularly contemplated making by the process of his application was the ordinary taper bored wax or soap record, which is the

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standard Edison product even to this day, and which is necessarily thick, brittle and unyielding, as distinguished from the thin, tough, and elastic celluloid records produced by complainant, for example.

Aside from this and omitting the Lioret patent from consideration, there is only one view, in my judgment, in which the matter of the thickness of the blank can be regarded as in any way distinguishing Edison's process from that of the Young patent, from which the reference to the thickness of the blank cylinder employed was admittedly intended to distinguish; and that is that the Edison process contemplates and is strictly limited to the printing of the record lines upon the surface of the blank by the pressure of its own expansive power, due to heating. It is undoubtedly a fact that the expansive force of the material itself can only be practically utilized to obtain the desired impression on the exterior of the blank when the latter is of relatively great thickness and capable of affording its own backing, as it were, to force itself against the interior surface of the matrix. And it is evident that no such action as this is contemplated or occurs in the Young process, in which the expanding pressure on the blank is evidently applied or derived from some source entirely aside from any expansive action of the material itself, this being also true of defendant's process, as will presently appear. So that, if regarded as thus limited, the Edison process may perhaps be distinguished from that of the prior patent to Young, along these lines.

But if it be not regarded as thus limited to the printing of the blank by its own expansive force when heated, the attempt to distinguish by the thickness of the blank operated upon is, in my judgment, nothing more or less than



absurd. Obviously the process is unchanged, whether the material employed is supplied in thin cylinders or thick ones. A thin cylinder will be softened by heat in the same manner as a thick one. It will be expanded by pressure in the same manner as a thick cylinder, and even more readily. And it will contract when cooled, and will free itself from the surface of the matrix so that it may be removed "by direct longitudinal movement" in the same manner as a thick cylinder, and even more rapidly. Every step in the process will be exactly the same and will produce exactly the same result, and exactly the same summation of results, no matter what the thickness of the cylinder employed, or whether it may or may not be capable of maintaining its shape after disengagement from the matrix. During the act of disengagement from the matrix the very presence of the matrix itself serves to maintain the cylindric shape of the blank, regardless of the thickness of the material employed, there being not the slightest tendency or necessity of the blank's losing this cylindric shape until actually withdrawn from the matrix, even with blanks of the thickness of paper, such as shown in "Defendant's Exhibit Young Patent Records Nos. 1, 2, 3 and 4."

In considering Edison's process as of any broad scope, therefore, its limitation as to the thickness of the blank operated upon is at best mere surplusage, if, indeed, it be not regarded as a bald aggregation of the article itself with the steps of the operation constituting the process. And in no case, in such a broad view, can this thickness of the blank operated upon be considered as distinguishing Edison's process in the least from the prior process of the Young patent, even assuming that exactly similar thick blanks were not shown to have been employed in the ex-

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actly similar process of the Lioret patent. Moreover, any distinction thus drawn between the Young process and the process of the Edison patent sued upon must equally obtain as between the Edison process and that employed by defendant, since defendant's process involves the use of essentially thin as compared with thick record cylinders, and is in every way like the Young process, except as it has been developed and perfected in ways as to which neither the Edison patent nor any of the patents of the prior art give the slightest hint.

Q. 18. Please state whether or not you have seen defendant's process as it is carried on in the regular course of defendant's business, and if you have, please briefly describe the process as thus carried on.

A. I have observed defendant's process by the hour, as that process is carried on in the regular course of defendant's business of manufacturing celluloid phonograms or phonographic records, and I am pretty thoroughly familiar with it. The process in brief is as follows:

The celluloid used for forming the blanks comes to the factory in the shape of thin-walled tubes about six feet in length. The thickness of the material of which the tubes is formed is between forty and fifty one-thousandths of an inch (less than a twentieth) and I understand that it is the thinnest celluloid which can be obtained in tubular form. These tubes are not straight or of uniform diameter. On the contrary, they come to the factory in very irregular shape, being buckled, flattened and indented in almost every conceivable way. This is due to the fact that they are formed by forcing the celluloid, when soft, through a thin annular opening over a mandrel, from which they are removed while still wet, and then hung up to cure or dry out, during which operation they



shrink and bend into all sorts of irregular shapes, though still preserving a generally tubular form.

The first operation in defendant's factory is to pass these rough tubes over a steam-heated mandrel, by which they are brought back to an approximately exact cylindrical shape and uniform diameter. Each tube is then cut into lengths of about four and a half inches, or just sufficiently longer than the length of the finished blank to enable the ends of the piece of tubing to be turned in to form the flanges, which are so noticeable a feature of defendant's record.

These flanges are turned in by forcing the piece of tubing down upon a heated plate having a rounded annular groove cut in it, into which the end of the tube is pressed. Two such plates are used, having grooves of slightly different shape, to form the flanges at the opposite end of the tube, as these flanges are not exactly alike, as will be noted. A rough blank, having its ends thus flanged in, I here produce, by way of example, and have designated "Defendant's Exhibit Defendant's Rough Blank." Such rough blank is then dyed in an acetone composition containing a black coloring matter, which gives it a smooth, glossy surface. The blank, when dried, is then ready for printing, and appears like the sample which I here produce and shall refer to as "Defendant's Exhibit Defendant's Finished Blank."

The process of printing the blank of course involves the production of a matrix, having upon its interior a relief of the record to be duplicated. These matrices are made by the defendant almost exactly as described in the English patent to Young. That is to say, a wax master record cylinder, of the well-known form, is placed in a phonograph and indented or cut with a spiral line by a

style attached to a diaphragm, which is caused to vibrate by the speaking voice or by the sounds from a musical instrument, band, or orchestra. This master record is then coated with a compound containing plumbago and of an electrically conductive nature, after which it is placed in an electroplating bath and plated with copper to a sufficient thickness to form a matrix cylinder, from which the wax master record is then removed. This copper matrix cylinder is then placed within a much larger iron ring, between which and the copper cylinder plaster of Paris is poured and allowed to harden, thus forming a matrix capable of sustaining great internal pressure.

Adjourned till Saturday, February 6, at 10 o'clock  
A. M.

Chicago, February 6, 1904. Parties met pursuant  
to adjournment. Present as before.

Witness Carter continues:

The printing of the blank with the duplicate record is then accomplished as follows: The finished blank like "Defendant's Exhibit Defendant's Finished Blank" is placed within the matrix, the outside diameter of the blank being slightly less than the bore of the matrix, so that it fits easily within the latter. No exactness of fit is necessary, and as both the matrices and the blanks vary more or less in diameter, it frequently happens in practice that there is a considerable amount of play—the sixteenth of an inch or so—between the matrix and the blank when inserted, although the fit is usually to within a thirty-second of an inch or so in the ordinary small or two-inch record.

Both the matrix and blank are now placed upon a bot-



tom plate, which is grooved somewhat like the hot plate used for turning in the end flanges, and the lower end of the blank drops down into this groove and is thereby centered over a hole in the plate, to which air and steam pipes are connected. The top plate is then lowered into the upper end of the bore of the matrix until it rests firmly upon the upper end of the blank, this top plate being carried at the lower end of a plunger rod, which is locked in place as soon as the top plate firmly engages the record.

Steam is now admitted to the interior of the blank through the hole in the bottom plate, under a pressure which ordinarily runs about forty pounds to the square inch, according to my observations of the steam-gauge. And under the heat and pressure of this steam the celluloid softens so that it readily conforms to the exact surface of the surrounding bore of the matrix. The steam pressure is ordinarily applied for about a minute, after which it is turned off and cold air immediately admitted in its place through the same opening in the bottom plate and at a pressure twice as great, or of upwards of eighty pounds to the square inch, according to the gauge. Under this air pressure the blank quickly hardens while still held in intimate contact with the interior surface of the matrix, and the record indentations received from the matrix are thereby permanently set in the surface of the celluloid.

The air pressure is now turned off and the printing operation is complete, subject only to the removal of the record from the matrix. This removal is accomplished by lifting the matrix out of the machine and placing it upon a bench, where it is allowed to remain until the celluloid blank, or rather record, has cooled and shrunk sufficiently to allow it to be drawn out endwise, this oper-

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ation being facilitated by the fact that the bore of the matrix is made on a slight taper, so that it more readily releases the phonogram. The length of time which the record is allowed to cool before being removed from the matrix is governed in practice by the other duties of the operator. Defendant's printing machines (by these I mean the pairs of top and bottom plates with their respective supports and steam and air connections) are arranged in duplicate sets of about ten or a dozen machines to each set. And the same operator handles both sets of machines—with the aid of an attendant—the printing operation being carried on in one set of machines while the matrices and inserted blanks are being removed from and again replaced in the machines of the other set. Several sets of matrices are also employed, so that part of them may be loaded with new blanks while others are standing with the printed records in them to cool and shrink until finally capable of being removed and replaced with new blanks to be printed. Ordinarily the cooling is carried to such point as will enable the newly printed record to drop out when a slight pressure is applied to the end of the record at the smaller diameter of the slightly tapered bore of the matrix.

The duplicate record is now complete, except that its flanges must be reamed out to fit the mandrel of the phonograph machine in which they are to be used, and the completed article is of the appearance of the sample which I here produce, and which bears on its end the legend "878—Uncle Josh in New York."

BY MR. SHERIDAN: Counsel for defendant here offers in evidence the three samples referred to by the witness, and requests the notary to mark the same respectively "Defendant's Exhibit Defendant's



Rough Blank," "Defendant's Exhibit Defendant's Finished Blank" and "Defendant's Exhibit Defendant's Finished Record 'Uncle Josh in New York.' "

Q. 19. What is the object of the end flanges of defendant's celluloid record?

A. They are three-fold: (1) To give the necessary rigidity and strength to the record, the cylindric wall of which is too thin to properly support itself except as thus strengthened. (2) To afford a means of engaging the thin, cylindric record with the smaller and tapered mandrel of a phonograph. (3) To afford a means of sealing the record tightly against the top and bottom plates of the printing machine when subjected to the pressure of the steam and air admitted to the interior of the record.

Q. 20. Is the contraction or shrinking which occurs when the record is cooled, and by reason of which the record frees itself from the surface of the matrix after being printed, in any way due to the presence of these flanges?

A. Not in the least. The record would shrink and free itself from the mold, or interior surface of the matrix, in exactly the same way, and even more quickly if these flanges were omitted, the only effect of the flanges being to delay the cooling operation somewhat by affording a greater mass of material for the heat to linger in. And this is equally true regardless of the thickness of the celluloid employed. For example, and as proving this, I have had made some exceedingly thin records from which the flange has been omitted at one end. These are exactly like "Defendant's Exhibit Young Patent Records Nos. 1, 2 and 3" except in the omission of the flange at one end, and they were made and printed in exactly the same way, and all of them in exactly the same way as defend-

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ant's regular commercial records are made. These additional thin records thus produced I shall refer to as "Defendant's Exhibit Young Records Nos. 5, 6 and 7." The object of making them, as above stated, was to see whether or not they would shrink, so as to free themselves from the matrix when cooled, without any buckling or collapsing other than the natural contraction due to the cooling of the material, notwithstanding the absence of the flange. They did so contract and loosen themselves from the surface of the matrix entirely by their own action, just as in the case of "Defendant's Exhibits Young Patent Records Nos. 1, 2 and 3;" and the contraction took place so immediately after the shutting off of the air pressure that in the case of No. 5, which was first printed, the record fell from the matrix without being touched, and while the matrix was being lifted from the machine to the bench. In the case of Nos. 6 and 7 the matrix was hotter, and it consequently took longer for the blank to cool, but in both these cases the contraction was sufficiently complete within a couple of minutes or so to cause the blank to drop from the matrix at the slightest touch.

I would also point out in this connection that the end of the record from which the flange was omitted was the uppermost end as the blank stood in the printing machine, and was the end which is wholly contained within the bore of the matrix during the printing operation. The lower end of the blank always projects down below the end of the matrix into the groove of the bottom plate, and I employed the flange at this lower end for the reason that it is almost impossible to make a proper seal against the escape of steam and air at this point unless a flange on the record itself is present. At the upper end



of the record, which is wholly within the matrix, it is more easy to attain a sufficient seal by a top plate which fits closely into the matrix, even if the flange is omitted. And the presence of the flange at the lower end of the record would obviously have no effect upon the shrinkage at its upper end. I would also state that of these exhibits, Nos. 6 and 7 appear exactly as they did when they dropped from the matrix. No. 5 has had its lower end flange trimmed out somewhat with a knife, but is otherwise exactly as it was when it dropped from the matrix, and its upper or unflanged end in particular has not been touched.

BY MR. SHERIDAN: Counsel for defendant here offers in evidence the exhibits last referred to by the witness, and requests the notary to mark the same respectively "Defendant's Exhibit Young Patent Record No. 5," "Defendant's Exhibit Young Patent Record No. 6" and "Defendant's Exhibit Young Patent Record No. 7."

Q. 21. Have you the matrix in which the exhibit records just referred to were made?

A. I have, and here produce it.

BY MR. SHERIDAN: The matrix thus produced by the witness is offered in evidence as "Defendant's Exhibit Matrix No. 665."

Q. 22. Please examine the copy of the patent to Messer, No. 705,772, of July 29, 1892, which I now hand you, and state how the apparatus described therein compares with the machines actually employed by defendant in printing its records, as described in your answer to Q. 18.

A. The machines so employed by defendant are sub-

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the matrix, it is a top plate which flange is omitted. lower end of the upon the shrinkage that of these ex- they did when they had its lower end knife, but is other- d from the matrix, ular has not been

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stantially exact copies of the apparatus shown in this Messer patent, and these machines are used in substantially the same way which the Messer patent describes.

Q. 23. Please examine the copy of the patent to Lambert No. 742,454, of October 27, 1903, which I now hand you, and state how the process described and claimed in this patent compares with the process employed by defendant in printing its celluloid records.

A. The general process described and claimed in this Lambert patent is the same as that which defendant employs, as I have described. The feature of sealing the joint between the blank cylinder and the top and bottom plates by means of integral flanges turned in from the body of the blank itself, which is really the keynote to a successful commercial process of producing celluloid records, is not disclosed in this patent, but appears to have been original with Messer in his patent No. 705,772 above referred to.

Q. 24. Is it practicable to make a duplicate phonographic record of wax or waxlike soap, such as complainant's Edison records are made of, using the machines and following the process employed by defendant in the manufacture of its celluloid records?

A. It is not. I have made several attempts to do so, using a regular Edison record cylinder of complainant's manufacture, and have been utterly unable to obtain any results whatever. The steam simply disintegrates the waxlike material—blows it into soap-suds, as it were—long before it is softened sufficiently to expand or be expanded against the matrix. The remains of an Edison soap record, which I here produce and have marked "Defendant's Exhibit Edison Soap Cylinder Destroyed by Lambert Process," show the result of one of these at-



tempts. And the remains of a similar Edison record, which I here produce and have marked "Defendant's Exhibit Edison Soap Cylinder Injured by Lambert Process," show the result of another such attempt. This latter attempt was made in the presence of a witness, a Mr. Miller, who was present in behalf of the complainant company by the invitation of Mr. Sheridan, defendant's solicitor, and Mr. Miller's suggestions were followed as closely as possible in making the test. The only essential difference between the two attempts was that in the latter, at Mr. Miller's request, the steam was turned on for only a few seconds, in the hopes that its destructive effect upon the waxlike soap would not be noticeable in such a short time, and it was not nearly so noticeable, as will appear from a comparison of the two exhibits. But as the result of the short exposure to the steam the blank did not become heated enough to take any impression whatever from the matrix, notwithstanding the pressure to which it was subjected.

BY MR. SHERIDAN: The two Edison soap records thus produced by the witness are here offered in evidence, and the notary is requested to mark the same "Defendant's Exhibit Edison Soap Cylinder Destroyed by Lambert Process" and "Defendant's Exhibit Edison Soap Cylinder Injured by Lambert Process," respectively.

Q. 25. Is it possible to produce one of defendant's celluloid records by the process described in the Edison patent in suit?

A. It is not. The thin celluloid will neither expand of itself so as to take the imprint of the matrix, nor can it be forced out by a tapered mandrel so as to take the impression, for the reason that its very thinness precludes

the possibility of its being provided with a tapered bore. And, obviously, the different sized openings in its flanges, which serve the same purpose in grasping the tapered mandrel of the phonograph as does the tapered bore of complainant's wax or soap records, would not aid in the least in the application of a mandrel to the interior of the blank for the purpose of forcing it out against the matrix. In fact, the very presence of these flanges, which are essential to a thin celluloid record such as is made by defendant, renders it impossible to insert a tapered mandrel for the purpose of expanding the record against the matrix, even assuming that the cylindric wall of the record was thick enough to admit of its being tapered on its interior.

Q. 26. Have you made any attempts to produce or print a thin celluloid record, such as is manufactured by defendant, by the process of the Edison patent in suit?

A. I have, and here produce two samples showing the result of these attempts. The first of these, which I shall designate "Defendant's Exhibit Defendant's Finished Blank Edison Processed No. 1," was one of defendant's ordinary blanks, ready for printing, and identical in all respects with "Defendant's Exhibit Defendant's Finished Blank." This blank I inserted in defendant's matrix (one of its ordinary stock matrices) which I here produce and shall refer to as "Defendant's Exhibit Matrix No. 879 A." I then placed both the matrix and the inserted blank in an oven and subjected them to a temperature of in the neighborhood of 300° Fahrenheit for fifteen or twenty minutes. The heat was so great that it softened the celluloid until its previously inturred flanges straightened out, as the exhibit shows, and the blank was left in the oven until the celluloid began to



show signs of disintegration, as the ends of the exhibit will indicate—indeed, it was left in until I did not dare to leave it there any longer for fear of the complete disintegration of the blank, an experience which I had just previously had with an exactly similar blank placed in the oven under exactly similar conditions and left there for about thirty minutes, at the end of which it was a mere mass of loosely adhering charred material. I then removed the matrix and blank from the oven and immediately plunged both into very cold water, for the purpose of shrinking the blank out of the matrix. Previous to entering the water the blank was tightly engaged with the matrix, but within a few seconds after being plunged in the water it had contracted to such an extent as to be readily withdrawn therefrom; and it was then in the exact condition in which it appears as I now produce it.

By MR. SHERIDAN: The sample thus produced and identified by the witness is here offered in evidence as "Defendant's Exhibit Defendant's Finished Blank Edison Processed No. 1."

(Witness continues): The second sample, which I shall refer to as "Defendant's Exhibit Defendant's Finished Blank Edison Processed No. 2," was heated in the same matrix and under the same conditions, but for a somewhat less time, and as a result it shows somewhat less the effect of the heating. In neither case, it will be noted, is there the slightest appearance of any imprint on the surface of the blank, although I was careful to pick out for these tests blanks which fitted the matrix as tightly as would any of those in defendant's stock, and much more tightly than do the blanks ordinarily fit the matrices in defendant's regular commercial work of manufacturing records

BY MR. SHERIDAN: The second sample referred to by the witness is here offered in evidence, and the notary is requested to mark the same "Defendant's Exhibit Defendant's Finished Blank Edison Processed No. 2."

Defendant's counsel also offers in evidence the last matrix referred to by the witness, and requests the notary to mark the same "Defendant's Exhibit Matrix No. 879 A."

Q. 27. Is it practicable to make thick celluloid records by the process of the Edison patent in suit?

A. It may be possible as a laboratory experiment, although I have not succeeded in doing so in the several attempts which I have made to this end. As a commercial operation it is not practicable, whether possible or not. The thick records "Defendant's Exhibit Carter Record No. 1" and "Defendant's Exhibit Carter Record No. 2" represent the results of two of my attempts to make such celluloid records by the Edison process.

These attempts were made in the presence of complainant's representatives, Messrs. Miller and Hecht, and Mr. Miller's suggestions were followed as closely as possible in making the tests. In both cases the heating was done with a tapered metallic mandrel inside of the blank and the matrix, the whole being placed in an oven heated to a temperature great enough to melt an ordinary Edison soap record, probably about 280° Fahrenheit. After being heated awhile the matrix was removed, with the blank and mandrel inside of it, and the mandrel was driven in by a number of smart blows with a heavy hammer. They were then returned to the oven and subjected to further heating, and then again taken out and the mandrel further driven in. This operation was re-



peated several times, with a view to securing the fullest advantage both of the heating and of the driving in of the mandrel in expanding the blank into intimate contact with the bore of the matrix. The entire operation in the case of "Carter Record No. 1" occupied nearly three-quarters of an hour. In the case of "Carter Record No. 2" the time occupied was not quite so great.

I also here produce a thick celluloid blank, which I shall designate as "Defendant's Exhibit Carter Record No. 3." This represents the result of a further attempt on my part to make a thick celluloid record by the Edison process, omitting the use of a mandrel and depending upon the expansion of the material itself for the purpose of impressing the blank cylinder against the bore of the matrix. This blank "Carter Record No. 3" was placed by me in "Defendant's Exhibit Matrix No. 879 A" and subjected therein to a heated atmosphere of in the neighborhood of about 300° Fahrenheit for a period of about twenty minutes, as long as I dared leave it for fear of disintegration. The matrix was then removed from the oven and plunged into cold water to shrink and loosen the blank, which was thereupon withdrawn and appeared exactly as it appears at the present time, without a trace of any record impressions upon its exterior.

BY MR. SHERIDAN: The thick celluloid blank thus last produced and identified by the witness is here offered in evidence, and the notary is requested to mark the same "Defendant's Exhibit Carter Record No. 3."

In this connection, however, it is only fair to the process of the patent in suit to say that the experiments with these exhibits, Carter Records Nos. 1, 2 and 3, were carried on under conditions which in some respects were

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*Deposition of Henry W. Carter.*

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rather crude. As there was no thick celluloid tubing at hand in the factory, or in the city, so far as I could determine, it was necessary to build up a thick walled blank by filling in a piece of the ordinary thin tubing employed by defendant with a piece of sheet celluloid bent into cylindric shape and cemented. And, as a consequence, the thickness of the blank produced was not quite uniform. Nor was its exterior diameter quite uniform, although probably as nearly so as defendant's finished blanks usually are. Neither did the blanks fit the matrix as closely as might have been possible, probably not more closely than defendant's regular finished blanks fit the matrices on an average in defendant's ordinary commercial process. For it will be understood that it is almost impossible to obtain celluloid blanks which are of exactly uniform diameter or will fit a given bore very exactly. It can be done experimentally by turning off the blank in a lathe, as the Edison patent suggests, but while turning off a wax or soap record is a rapid and easy operation, the turning off of celluloid is so slow and difficult as to be commercially impracticable.

While, therefore, the expansion of the blank against the matrix may not have been as perfect as might have been the case under the most favorable conditions, these experiments are, in my judgment, conclusive as showing at least that the printing of a celluloid blank by the force of its own expansion when heated is an idle dream, the utter impracticability of which only goes the further to show that the patentee Edison knew nothing of the action of this material under his process at the time he disclosed it to the Patent Office. With sufficient heat and great pressure applied from some source entirely aside from the material itself, celluloid may be made to intimately en-



gage the bore of the matrix, but the material is too elastic, and not soft enough, even in its most plastic condition (it never melts or becomes fluid), to enable it to take the impression by the force of its own expansion. Moreover, I am also convinced that it is commercially impracticable to obtain the necessary expansion by the use of a tapered mandrel, although, as before stated, it may be possible to do so as a laboratory experiment.

Q. 28. I take it, then, that you do not consider either the Edison patent in suit, or the Lioret patent, in so far as that relies upon a tapered mandrel to expand the blank, as disclosing practically operative processes of making duplicate phonographic records of celluloid. Is this correct?

A. It is. In my judgment neither the Edison process nor the Lioret process, in so far as it contemplates the use of a tapered mandrel to expand the blank, discloses a practicable process for the commercial manufacture of celluloid records. Not only is the employment of a tapered mandrel a doubtful expedient, so far as the obtaining of the desired intimacy of contact between the record and the matrix is concerned, but it necessarily involves the employment of a blank having a bore tapered throughout its length, and this means a blank of great thickness and necessarily great weight and prohibitive cost. For with the weight increased fourfold, as with the Exhibits Carter Records Nos. 1, 2 and 3 when compared with defendant's regular records, the cost of the celluloid alone would be more than the entire selling price which these records can command in the market in competition with the ordinary wax or soap records.

The fact is that up to the disclosure of the Messer patent no practicable method for the commercial manufac-

ture of celluloid records was known. The Lioret and Edison processes, with their tapered mandrel expansion, necessarily involved the employment of thick walled taper bored records, like complainant's Edison wax or soap record, which has so long been standard on the market. And while Young contemplated employing thin celluloid blanks he did not disclose any practicable means of expanding such thin blanks any more than Edison did. Nor did any of them realize that heating with steam was the only practicable method of softening the celluloid and expanding with air the only practicable method of setting the celluloid while in intimate contact with the matrix. It remained for Messer to develop these indispensable steps of defendant's process, which is believed to be the only process of manufacturing celluloid records that is commercially possible. And it remained for Messer to devise the method of sealing the record against the top and bottom plates which confined the air and steam pressure within the record by means of flanges turned over from the body of the celluloid cylinder, a conception which is the keynote to success in this line of manufacture,—the final step crossing the line from commercial failure to commercial practicability.

Q. 29. In this development toward the ultimately successful process of manufacturing commercial celluloid records, what assistance do you find that the Edison patent in suit gave?

A. Not the least in the world. I think I am perfectly safe in saying that no unprejudiced person can examine the Young and Lioret patents of the prior art and the Edison patent in suit, in connection with the Messer patent, without concluding that there is not a single idea or suggestion in the Edison patent which was not previ-



ously disclosed in the Young and Lioret patents, and which was availed of in the process followed by Messer and employed by defendant. In fact, the only possible original idea which can be ascribed to the Edison patent is that of printing a duplicate phonographic record by forcing a blank against the matrix by its own expansive force when heated, and this is neither possible with the celluloid blank, nor is it attempted in the Messer process, wherein the expanding of the blank against the matrix is entirely due to the fluid pressure supplied to the interior of the celluloid cylinder. The development of the Messer process is much more in line with the process of the Young patent, and essentially involves nothing more than the turning in of end flanges on Young's thin celluloid record cylinder and the introduction of steam and air to the interior of the resulting flanged cylinder to soften, expand and set it in contact with the mold. And what possible information is there to be found in the Edison patent tending to suggest development? Young tells us to heat the blank until plastic enough to take the impressions of the matrix. Edison says to subject the blank or the blank and matrix to a "heated atmosphere," which is equally indefinite, and in his original disclosure insists most vehemently that the heating contemplated is solely to expand the blank, and not sufficient to alter its hardness or render it plastic. Young tells us to press the heated and plastic blank gently into intimate contact with the matrix until it receives the exact imprint thereof. Edison instructs us to obtain any necessary further expansion with a tapered mandrel, which it is absolutely impossible to employ with defendant's thin walled blank, and the use of which for exactly the same purpose had already been disclosed by Lioret. And, finally, Young

tells us to cool the printed record,—which inevitably involves a slight shrinking or collapsing inwardly—sufficient to free it from the matrix, and states that this enables it to be cleanly and easily removed from the mold, obviously “by direct longitudinal movement;” while Edison simply states the same thing a little more definitely by saying, in words copied from Lioret, that the cooling of the blank will shrink it so as to free it from the molds, and that it may then be removed “by direct longitudinal movement.”

There is not one thing which any worker in this art would be enabled to accomplish with the Edison patent before him, which he would not have been able to accomplish with the Young and Lioret patents before him; and there is not one hint or suggestion in the Edison patent which would be of the slightest use to a worker in this art in developing from the Young process to defendant's process of the Messer patent.

Q. 30. What degree of heat do you understand to be meant by the “gentle heat” described by Young in his British patent of 1894?

A. Evidently such a heat as will render the celluloid cylinder pliable or plastic enough to properly take the impression from the matrix. The necessary degree of heat for this purpose would depend somewhat on the method of heating employed. Boiling water will soften celluloid, or a dry heat of somewhat less than 300° Fahrenheit will suffice. Either of these temperatures may be properly called a “gentle heat,” as compared with the fierce heat of a flame or furnace, for example, which would be measured at many hundreds of degrees, running into the thousands.

Q. 31. What degree of heat is employed by defendant in its Messer process?



A. From 275° to 290° Fahrenheit, according to the pressure of steam employed.

Q. 32. Can defendant's process be carried on by the use of steam alone and without the subsequent introduction of cold air under pressure?

A. It cannot, so far as I know. I made several attempts to print records by the use of steam pressure alone, but the best results I was able to obtain were so imperfect as to be useless. For example, I here produce a blank which I subjected to defendant's printing process, except that I did not apply the air pressure. This blank is printed in spots, but cannot be used for reproducing intelligible sounds.

BY MR. SHERIDAN: The blank thus produced and identified by the witness is offered in evidence, and the notary is requested to mark the same "Defendant's Exhibit Carter Record No. 4."

Q. 33. What is the temperature of the air used in defendant's process?

A. It is of the same temperature as the room, except as it is inevitably warmed somewhat by entering the mold through the same inlet pipe which admits the steam, and which is necessarily previously heated by the steam. The Messer patent discloses substantially the arrangement of the pipes in this respect.

Q. 34. Are the in-turned end flanges a necessary feature of defendant's records?

A. They are absolutely necessary, being indispensable to each of the three purposes for which these flanges are provided, to wit: They are necessary to supply rigidity and stiffness to the cylinder, the wall of which is not thick enough in itself to maintain its shape, as any one may readily determine by cutting off the end flanges with a sharp

knife and noticing how readily the plain celluloid cylinder remaining may be distorted. They are indispensable in that they furnish the sole means of gripping the tapered mandrel of the phonograph and holding the record centrally thereon. And they are indispensable as means of sealing the record against the top and bottom plates in printing. It is possible to print without these flanges, or without one of them, as the Exhibits Young Patent Records Nos. 5, 6 and 7 have demonstrated, but it is not practicable to do so as a commercial operation.

Q. 35. Please briefly compare claims 2, 3, 4, 5, 9, 10 and 17 of the Edison patent in suit with the patents of the prior art, to which you have referred.

A. Of these claims Nos. 2 and 3 are exactly met in the British patent to Young. This patent, as compared with claim 2, discloses a method of producing hollow, cylindric phonograms, which consists in the following steps, to wit (1) in obtaining a mold having a reverse phonogram record on the inner wall of a cylindric opening; (2) in forming a hollow cylindrical plastic phonogram within said mold; (3) in releasing the phonogram from the mold by a radial contraction of the phonograms sufficiently to entirely clear the surfaces (this inevitably follows the cooling of the blank, as Defendant's Exhibits Young Patent Records Nos. 1-7 conclusively demonstrate); and (4) removing the phonograms from the mold by direct longitudinal movement.

As compared with claim 3, the Young patent discloses a method of producing hollow cylindric phonograms, which consists (1) in obtaining a mold having a reverse phonogram record on the inner wall of a cylindrical opening; (2) in forming a hollow cylindric plastic phonogram within said mold; (3) in releasing the phonogram from



the mold by a reduction in temperature sufficient to entirely clear the surfaces; and (4) in removing the phonogram from the mold by direct longitudinal movement. As to this latter step, it will be observed that direct longitudinal movement is the natural and only feasible movement which can occur under the circumstances. As pointed out in connection with Defendant's Exhibits Young Patent Records Nos. 1-7, the cooling of the celluloid cylinder causes it to contract so that it drops straight out from the mold, when the latter is lifted, either without being touched at all, as in some cases, or as the result of a slight touch or tap on its end.

With regard to claims 4, 5, 9, 10 and 17, it is my opinion that these are equally met in substance by the Young patent, since the process which forms the subject-matter of the claims is exactly the same whether carried out with a thick or a thin blank, as I have already pointed out, and since the Young patent discloses every step of the operation described in each of these claims, and can only be possibly distinguished from them by their reference to the thickness of the blank. For example, as compared with claim 17, the Young patent discloses a method of producing record cylinders for phonographs which consists (1) in first forming a record on a cylinder of wax or other relatively soft material; (2) in rendering the surface of the wax cylinder electrically conductive; (3) in electrolytically depositing metal thereon forming a matrix; (4) in outwardly expanding under pressure within the matrix a cylinder or tube of softened material; and (5) in finally removing the cylinder or tubes by direct longitudinal movement.

The Lioret British patent, in my judgment, equally anticipates in exact terms, claims 2, 3, 4, 5, 9 and 10.

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And it substantially anticipates claim 17, which differs only in specifying that the original master cylinder is of wax, as was the common practice at the date of the Lioret patent. The Lioret patent shows a method of producing hollow cylindric phonograms, which consists (1) in obtaining a mold having a reverse phonogram record on the inner wall of a substantially cylindrical opening; (2) in forming a hollow substantially cylindrical elastic phonogram within said mold; (3) in releasing the phonogram from the mold by a radial contraction of the phonogram sufficient to entirely clear the surfaces; and (4) in removing the phonogram from the mold by direct longitudinal movement. As to the last of these steps, I have already pointed out that this direct longitudinal movement is perfectly feasible with a record of large diameter, such as "Defendant's Exhibit Lost Chord Record," and that in any case the essential process is the same, whether the record is withdrawn directly endwise or by unscrewing it.

The same comparison, thus made with claim 2, obviously also holds as to claim 3, which is simply a repetition of claim 2 in slightly different language. And it equally holds as to claims 5, 9, 10 and 17, since the celluloid blank of Lioret is obviously "sufficiently thick to maintain its shape during and after the act of disengagement from the matrix," even assuming that this question of the thickness of the blank is entitled to any material consideration in connection with the essential process claimed.

As to claim 17, which is differentiated from Lioret in words by the description of the master record as of "wax," it has already been pointed out at length, as acknowledged by the Edison specification, that it makes not the slightest difference to the essential process set forth



how or in what manner the matrix is obtained or from what kind of a master record. And it had also been pointed out that this exact method of obtaining matrices from original wax records was well known at the date of the Lioret patent, having been disclosed in the British patent to Young and in Edison's earlier patents heretofore referred to, so that the substitution of wax or steel as a master record was simply the making use of a well-known equivalent, even assuming that the character of the master record can be considered as material in a discussion of a process of subsequently producing duplicate records.

In my judgment, therefore, each of the claims Nos. 2, 3, 4, 5, 9, 10 and 17 of the Edison patent in suit is absolutely and completely anticipated in every essential particular in both the British patent to Young and the British patent to Lioret; and also in the U. S. patent to Lioret, which differs from the British patent only in a few details.

Q. 36. Please state whether or not you find defendant's celluloid records to be made of a material "sufficiently thick to maintain its shape during and after the act of disengagement from the matrix," within the meaning of this expression as employed in the Edison patent in suit.

A. I do not so find. On the contrary, the shape of defendant's record is maintained by their intumed end flanges, without which the records are likely to become distorted and misshapen when removed from the matrix.

Q. 37. To what extent, if at all, do you find defendant's process of producing duplicate phonographic records to be identical with the process set forth and claimed in the Edison patent in suit?

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A. Only to the extent that both are identical with the prior processes of the Lioret and Young patents. As a whole, defendant's process and that of the Edison patent in suit are necessarily substantially different, since the process described and claimed in the Edison patent in suit will not and cannot be made to produce defendant's records, and since the process employed by defendant will not and cannot be made to produce complainant's records.

Obviously, the question of resemblances or differences between two processes cannot be determined by a mere matter of words. And when neither process is capable of producing the article for the making of which the other process was particularly and accurately designed, it necessarily follows that the two processes are essentially different.

Q. 38. In your opinion, does defendant, in manufacturing its celluloid records, follow the process set forth in the patent to Lambert No. 645,920, of March 20, 1900?

A. It does not. In the first place this Lambert patent, like the Edison patent in suit and the British patent to Young, does not set forth any practicable process of manufacturing celluloid records. It describes with some elaboration the already well-known method of making a copper matrix from a wax master record, but it is even more indefinite as to how this matrix is employed in the the manufacture of duplicate records than are the Edison and Young patents; and in so far as it gives any details at all, they are different from any details of defendant's process. In the second place, the process of this Lambert patent is specifically limited to the manufacture of records of "material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix," and, as I have already pointed out, I do not find defendant's records to be of any such thickness.



Q. 39. You have stated it as your understanding that complainant has never commercially manufactured duplicate phonographic records by the process of the Edison patent in suit, but that it actually employs a different process covered by another Edison patent. Can you give the date and number of the other patent referred to?

A. No. 667,662, issued February 5, 1901.

Counsel for defendant offers in evidence copies of the following patents:

U. S. patent No. 484,582, of October 18, 1892, and the same is marked "Defendant's Exhibit Edison Patent 484,582."

U. S. patent No. 526,147, of September 18, 1894, and the same is marked "Defendant's Exhibit Edison Patent 526,147."

U. S. patent No. 528,273, of October 30, 1894, and the same is marked "Defendant's Exhibit Lioret Patent 528,273."

U. S. patent No. 645,920, of March 20, 1900, and the same is marked "Defendant's Exhibit Lambert Patent 645,920."

U. S. patent No. 667,662, of February 5, 1901, and the same is marked "Defendant's Exhibit Edison Patent 667,662."

U. S. patent No. 705,772, of July 29, 1902, and the same is marked "Defendant's Exhibit Messer Patent 705,772."

U. S. patent No. 742,455, of October 27, 1903, and the same is marked "Defendant's Exhibit Lambert Patent 742,455."

British letters patent to Lioret, No. 23,366 of 1893, and the same is marked "Defendant's Exhibit Lioret British Patent."

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British patent to Young, No. 1,478 of 1894, and the same is marked "Defendant's Exhibit Young British Patent."

Counsel for defendant also offers in evidence two certified copies of the Patent Office records relating to the application upon which the Edison patent in suit was issued, to wit: Application of Thomas A. Edison, Serial No. 672,650, filed March 5, 1898. The first of these certified copies covers the file-wrapper and contents of said application up to the 16th day of June, 1900, and the same is marked "Defendant's Exhibit Edison File-Wrapper A." The second of these certified copies covers the file-wrapper and contents of said application from and after June 16, 1900, and the same is marked "Defendant's Exhibit Edison File-Wrapper B."

Counsel for defendant here gives notice that he will print as a part of defendant's record the depositions of Thomas A. Edison and Charles Wurth, which are placed on file in this case by complainant.

Counsel for defendant also gives notice that at a proper time and place he will move the court for leave to amend defendant's answer in order to set up, as a part of the prior art, the British patent to Lioret, No. 23,366 of 1893.

Adjourned till Wednesday, February 17, 1904, at 10 o'clock A. M.

Chicago, February 17, 1904. Parties met pursuant to adjournment. Present as before.

*Cross-Examination by Mr. Dyrenforth.*

X-Q. 1. You have referred to certain duplicate phonograph records which you made in my presence at the



defendant's factory. It is a fact, is it not, that these celluloid cylinders were prepared for you in advance of your going to the factory?

A. Yes.

X-Q. 2. By whom were they prepared?

A. I do not know. My instructions as to what I wanted were given to Mr. Philpot.

X-Q. 3. What instructions did you give Mr. Philpot as to the making of those celluloid cylinders?

A. I told him that I wanted to see if I could not make some very thin celluloid records, such as the British patent to Young evidently contemplated, and that I would like to have him procure some thin celluloid tubing for the purpose. He replied that he could not do this, because of the fact that it was impossible to make celluloid tubing thinner than that which defendant used for making its standard indestructible celluloid records—such tubing as that which "Defendant's Exhibit Defendant's Finished Blank" is made of. I then asked him if he could not get some very thin celluloid in sheet form and cement its edges together after bending it into the form of a cylinder. To this he replied that he would endeavor so to do, and later on he telephoned me that he had done so and that the resulting cylinders were ready for my use.

X-Q. 4. In making these records in my presence, what was the first thing which you did with the prepared celluloid tube?

A. The first thing which I personally did was to remove the tube from the matrix, after it had been printed and had cooled and contracted sufficiently to permit of its ready removal. The actual printing operation was carried on by Mr. Philpot himself, with an attendant. This

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*Deposition of Henry W. Carter.*

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operation, as carried on in our presence, consisted in first inserting the thin celluloid blank in the matrix; in then placing the matrix upon the bottom plate of the machine and bringing down the top plate into the upper end of the matrix and against the blank; in then turning the steam into the blank for a few seconds; and, finally, in turning off the steam and turning on the air pressure. After the air pressure was turned off the matrix was lifted from the machine, and I myself attended to the removal of the printed blank or record from the matrix.

X-Q. 5. You can recall distinctly, can you not, how the tube was inserted into the matrix?

A. I do not remember any noticeable peculiarity about the inserting of the tube into the matrix except that in one or two instances the blank fitted the matrix so tightly that it was difficult to insert and had to be buckled in the act.

X-Q. 6. Is it not a fact that the blank, before it was inserted into the matrix, was considerably distorted from its tubular form?

A. Yes; none of these blanks were of anywhere nearly exact tubular form before being placed in the matrix. The fact that they were made, as they were, of a piece of sheet celluloid, bent over until its ends could be joined and cemented, caused all these blanks to assume an irregular shape, very similar to that which "Defendant's Exhibit Young Patent Record No. 4" now exhibits.

X-Q. 7. What instructions, if any, did you give Mr. Philpot as to the cylindrical diameter that these blanks should have?

A. I do not know that I gave any definite instructions on this point. I assumed that they would be made as nearly as practicable of the same diameter as defendant's



regular blanks, such as "Defendant's Exhibit Defendant's Finished Blank," and I think they were intended to be so made. Mr. Philpot informed me, however, that it was extremely difficult to secure any exact uniformity in the diameter of these thin blanks, which had to be made by bending up a sheet of celluloid and cementing its edges.

X-Q. 8. You understand, do you not, that they were formed by being bent around the mandrel and the edges *cemented* together?

A. I do not know how they were formed, but would suppose that the method of forming them about the mandrel, which you suggest, would be the most natural one.

X-Q. 9. Are the regular blanks of the defendant company initially shaped upon a mandrel?

A. Yes. The rough tubing, as it comes to the factory, is forced over a steam-heated mandrel, which gives it its correctly cylindric shape and a fairly uniform diameter.

X-Q. 10. Is it not your understanding that the blanks which you used in the experiments when I was present were formed upon the same mandrel that the defendant's regular tubes are shaped upon?

A. No, that is not my understanding, and I would rather suppose that a larger mandrel would have been required, for the external diameter of the thin blanks was at least as large, on the average, as the external diameter of defendant's regular blanks, and in some cases it appeared to be slightly larger. "Defendant's Exhibit Young Patent Record No. 4," it will be remembered, was printed by slipping it over one of defendant's regular records.

X-Q. 11. You have testified, I believe, the amount of clearance that exists between the exterior of the defendant's regular blank and the inner wall of the matrix, but I should like to have you state it again at this place?

A. There is considerable variation in this fit, according to my observation of the regular commercial operation of manufacturing defendant's record. It appears that the bores of the matrices vary slightly in diameter, and also that defendant's finished blanks vary slightly in diameter. So that some blanks are too large to readily enter some of the matrices, while other blanks are noticeably smaller than some of the matrices. In practice I observe that the attendant would take a handful of finished blanks and walk along the bench where the matrices lay, dropping the records into the matrices wherever they would fit easily. If one of the blanks seemed to resist entering the matrix, he would try another, until he got one small enough to drop into that matrix, and then would try the temporarily discarded blanks in other matrices until he found those of large enough bore to readily receive the blanks. The looseness of the fit, on the other hand, did not appear to be considered, and amounted to upwards of a thirty-second of an inch, I should say, in many cases, with the small size or two-inch records. The fit of "Defendant's Exhibit Defendant's Finished Blank" in "Defendant's Exhibit Matrix No. 665" is about a fair sample of the way defendant's blanks ordinarily fit into the matrices in defendant's regular commercial operations of printing these blanks, according to my observations. With the larger blanks, such as are used for the four and three-quarter inch record, the fit is even looser, and I am informed that with defendant's process it is possible to successfully print one of these larger sized blanks when it is as much as a quarter of an inch less in diameter than the bore of the matrix.

X-Q. 12. Am I correct in understanding that in the experiments which you tried in my presence you carried



out the regular method of manufacturing employed by the defendant, with the exception that you used blanks of thin celluloid, bent into tubular form and cemented?

A. Yes.

X-Q. 13. In these experiments to what extent is it your understanding that you followed the method of the Young British patent?

A. It is my understanding that I followed the British patent to Young to the fullest extent, except for the imperfections in my blanks. In doing so, however, I carried out the general directions of the Young patent as to heat and pressure, along the lines of defendant's process, and by the use of the improvements of defendant's Messer patent.

X-Q. 14. Then, I suppose that it is your understanding that the defendant in its regular operations fully carries out the method of the Young British patent, using, however, thicker blanks, flanged inward at the ends and with the addition of what you have referred to as the improvements of the Messer patent?

A. Yes, that is my understanding, these additions and improvements being essential to a commercially practicable method of producing celluloid records.

X-Q. 15. In the experiments which you conducted in my presence, did you heat the matrix before you inserted the blank, or cause this to be done?

A. My recollection is that the matrix was not heated when the first blank was printed, but in the succeeding printing operations—which were carried on with the same matrix—the matrix was more or less heated by reason of the previous admission of steam to its interior in the preceding printing operations. In defendant's regular commercial practice, the matrices never get cold from the beginning to the end of the day's run of records.

Carter.

*Deposition of Henry W. Carter.*

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X-Q. 16. Do you know whether or not the matrices are cold at the beginning of the day's run, and for the first operations in defendant's regular work?

A. I think they are.

X-Q. 17. Was there not in your experiments a considerable interval in each instance between the making of the records?

A. There was an interval of some minutes. In two instances I remember that we took time to place the newly printed record on a phonograph in an adjoining apartment, in order to determine whether or not the printed record thereon was a perfect sound record.

X-Q. 18. And in one instance the matrix containing the record was put outside the window, was it not?

A. Yes.

X-Q. 19. And do you recall that it was an extremely cold day?

A. Yes, it was a very cold day, with the thermometer in the neighborhood of zero, and it was for this reason that I placed the matrix on the window-sill outside, in order to thereby quickly chill the celluloid blank and enable it to be removed.

X-Q. 20. Please describe briefly how the defendant company manufactures its matrices?

A. They take a master record of wax or wax-like material, place it in an electro-plating bath, after washing its record surface with a plumbago composition, which is electrically conductive, and thereby deposit metallic copper around the master record until the deposit forms a cylinder about a thirty-second of an inch thick. The wax record is then removed from the bath with the copper cylinder around it, and is subsequently removed from the cylinder, I think by contracting it, although I am not



certain as to this. It might, of course, be melted out, or broken or dissolved out. The copper cylinder is then placed within a much larger iron cylinder, and the space between them is filled up with plaster of Paris, which forms a solid backing for supporting the copper. I believe also that at some stage of the operation a very light deposit of nickel is also plated upon the interior of the matrix to better protect its record surface.

X-Q. 21. How does the bore of that matrix compare in diameter with the master record from which it was made?

A. I should say that the bore of the matrix was of exactly the same diameter as the master record, at normal temperature.

X-Q. 22. Then, is the blank of celluloid employed by the defendant in its regular operations of the same diameter as the master record, in view of what you have stated concerning the clearance?

A. No, it is somewhat smaller.

X-Q. 23. The Young British patent contains the following from lines 47 to 50, inclusive:

"To produce a working record from the said electrode this and its case would be warmed or slightly heated by any convenient means, and within the said electrode would then be placed a very thin hollow cylinder of the same size externally as that of the original wax cylinder upon which the record was first taken."

The patent goes on to say that the cylinder so inserted may be celluloid, xylonite, vulcanite, or the like. Does the defendant in its regular practice follow those directions of the Young patent?

A. Substantially, yes. As I have before stated, there is no exactness of fit necessary or aimed at in defendant's

process as between its blanks and the matrix. For under the heat and pressure of the steam and air the blank, even if quite inaccurately fitted, will be forced to conform exactly to the surface of the matrix, and this whether the original fit was tight or loose. The only reason for avoiding a tight fit is to avoid any possible damage to the record surface of the bore of the matrix which might occur if a tight fitting blank of the hard celluloid could be forced into it.

Moreover, with any of these processes it is substantially true that the blank, before being introduced to the matrix, and the completed record, after being removed from the matrix, are of the same diameter as the original master record, this being necessarily so if the newly printed record is to be an exact duplicate of the original, as all of these patents, including both the Young patent and the Edison patent in suit, state it to be, and as the results of defendant's process prove it to be in substantial fact. This substantial identity in diameter, however, does not preclude the existence of whatever slight differences may be required to permit the insertion of the blank in the matrix, or permit the removal of the printed duplicate from the matrix without damage to the record surfaces of either the duplicate or the matrix. And where the Young patent states, as you have quoted, that the celluloid blank is of the same diameter externally as that of the original wax record, it undoubtedly refers to the substantial fact and leaves out of account any such minute variations as the ready fitting of the blank into the matrix might involve. Just as the Edison patent in suit, in describing the duplicate phonographic records produced by its process, refers to them as "absolutely identical in every respect with the original record," although, as a matter



of fact, these duplicate records will necessarily be slightly smaller in diameter than the original record.

X-Q. 24. Suppose the celluloid tube of the Young British patent to be as the patent describes it, that is, "of the same size externally as that of the original wax cylinder upon which the record was first taken," how would you get it into the matrix without buckling or collapsing it?

A. It might be readily done by cooling the celluloid first so that it would contract sufficiently to readily enter the matrix. It will be remembered that the depth of the sound groove in a phonographic record is but a few ten-thousandths of an inch deep, never, I believe, exceeding a thousandth of an inch, so that a shrinkage of two one-thousandths of an inch is all that would be required to permit the celluloid cylinder to enter without buckling, even assuming that the exterior diameter of the celluloid cylinder is precisely the same as that of the original record.

X-Q. 25. What means would you suggest for thus cooling and shrinking the celluloid blank?

A. On a cold day it might be done by sticking it out of the window, or otherwise, by placing it in an ice chest, or thrusting it into ice water.

X-Q. 26. Does any other way occur to you, except subjecting the blank to a temperature below the normal temperature, and thus shrinking it?

A. Obviously it might be done in a converse manner by heating the mold until it expanded sufficiently to receive the blank.

X-Q. 27. Why did you not mention this method in your last answer?

A. Simply because the other method was the first to

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Mr. Wurth, to the effect that in some cases the wax or  
soap blanks used in the Edison process of the patent in  
suit were cooled and contracted for the purpose of ren-  
dering them small enough to enter the matrix. On the  
other hand, I note that the Young patent refers to the  
heating of the matrix, which, as above stated, would tend  
to permit the entrance of the celluloid cylinder without  
collapsing, even if made of precisely the same diameter  
as the original wax record.

X-Q. 28. At the time you suggested the shrinking of  
the blank by the action of cold, did you not have fully in  
mind the fact that the Young patent itself refers to heat-  
ing the matrix?

A. I did not. The fact temporarily slipped my mind.

X-Q. 29. Assume the celluloid blank of the Young  
patent to be of the same diameter as that of the master  
record: Assume also that the bore of the matrix has no  
taper: Assume also that the matrix is preliminarily  
heated to expand the bore to receive the blank: Assume  
also that the blank is made plastic and pressed outward  
against the matrix, as described in the Young patent:  
What would you do then in order to get the blank out  
without buckling it?

A. Simply cool the blank, when it would inevitably  
shrink away from the wall of the matrix, so that it could  
be easily withdrawn endwise, without its cylindric shape  
being in any way distorted. This might be done either  
by letting cold air blow through the bore of the record,  
or by immersing the matrix with the record in cold water,  
or by letting the matrix stand until both it and the record



cool down to the normal temperature—in any case the result would be the same—that the celluloid cylinder would shrink away from the bore of the matrix so as to be readily removable therefrom without buckling. And this would be equally true whether the bore of the matrix was cylindric or slightly tapered, like the bore of defendant's later matrices.

X-Q. 30. Do you find in the Young patent any suggestion of chilling the blank by means of cold air or ice water?

A. The Young patent simply speaks of cooling the blank to enable it to be removed from the matrix. It does not mention any particular cooling medium.

X-Q. 31. Is not the language to which you refer in the Young patent, "and when the said plastic cylinder has cooled, I am enabled," etc.?

A. Yes.

X-Q. 32. Giving the usual force to that expression, do you understand it to convey any idea of cooling below normal temperature?

A. Not necessarily, although the expression could be used with perfect propriety if a cooling below the normal temperature were contemplated. As a matter of fact, however, the contraction of celluloid is so much greater than that of metals, and particularly of copper, and the plastic point of celluloid is so high in temperature, that the complete cleavage or separation of the celluloid from the bore of the matrix will inevitably take place long before even the normal temperature is reached, so that the subjecting of the celluloid record or of the matrix and record to any cooling medium below normal temperature will be in any case entirely unnecessary, except for the purpose of expediting the operation.

X-Q. 33. When the celluloid blank of the Young patent is pressed outward against the slightly expanded matrix, is the diameter of the blank increased?

A. Yes, it is necessarily increased to the extent of double the depth of the phonographic record grooves, which are reproduced in relief on the surface of the matrix, a total amount of possibly two one-thousandths of an inch.

X-Q. 34. Suppose the blank to be of the same diameter as the master record, and suppose the bore of the matrix to be expanded by the application of heat to give a clearance sufficient to permit the blank to be easily inserted; in that case to what extent would the diameter of the blank be increased by following the directions of the Young patent in the matter of pressing it outward against the matrix?

A. It must necessarily be increased to the extent of a radial expansion equal to the depth of the record thread formed in relief on the bore of the matrix. It is this expansion, or increase in diameter, in fact, which causes the thread to be impressed into the plastic surface of the blank, and without such increase in diameter there could be no impression.

I assume now that you are not inquiring as to the ultimate diameter of the celluloid record when cooled to normal temperature. This in every case will be smaller than the normal diameter of the bore of the matrix.

X-Q. 35. Is it not a fact that under the conditions of my last question the increase in the diameter of the blank, when pressed outward against the wall of the matrix, will be equal to double the clearance plus the depth of the phonographic record?

A. Yes. My last answer stated the least possible ex-



pansion which could occur, or that which would result when the blank exactly fitted into the matrix.

X-Q. 36. Keeping in mind my last two questions for the conditions, and assuming the blank to have been introduced at normal temperature into the matrix, what diameter will the blank assume when it cools back to the normal temperature?

A. A diameter of approximately a thirty-second of an inch less than the diameter of the master record, in the ordinary two-inch size. In other words, the final diameter will be that due to the shrinkage of the blank from a temperature of 275° or 300° Fahrenheit, at which it will be in a plastic condition and in intimate contact with the matrix, and consequently of the same diameter as the bore of the matrix, no matter what its diameter was when introduced to the matrix. And inasmuch as the contraction of the celluloid from this temperature will be materially greater than the contraction of the copper from this temperature, the ultimate diameter of the celluloid record, when cooled to normal, will be appreciably smaller than the ultimate diameter of the copper matrix when cooled to normal, and this latter diameter will be that at which it started, to-wit, the diameter of the master record. In mentioning a thirty-second of an inch as the difference in shrinkage between the copper and the celluloid on an ordinary two-inch record, I am going by my observation rather than by any theoretical results. I will, however, figure out the theoretical difference and let you have the result, if you desire me to.

Adjourned till Thursday, February 18, at 10 o'clock A. M.

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ant to adjournment. Present, as before.

X-Q. 37. In the course of your description of the oper-  
ations conducted by you with thin celluloid cylinders, and  
which you have said were conducted in absolute accord-  
ance with the Young British patent, you use these words,  
"and in every case, upon being allowed to cool, the cyl-  
inder contracted, collapsed, shrunk, or whatever it may  
be called, so as to free itself from engagement with the  
bore of the matrix." The Century Dictionary defines the  
word "collapse" as follows: "To fall together, or into  
an irregular mass or flattened form, through loss of firm  
connection or rigidity and support of the parts or loss of  
the contents, as a building through the falling in of its  
sides, or an inflated bladder from escape of air contained  
in it." Do you think this definition accords with your use  
of the word?

A. No, and as before stated, I consider the use of the  
word "collapsed," as applied to shrinkage or contraction,  
as a rather loose and inaccurate employment of language.  
I believe, however, that Webster's Dictionary gives a defi-  
nition of "collaspe" which includes contraction or shrink-  
age.

X-Q. 38. When a metallic vessel, for example, is sub-  
jected to heat, it expands, does it not?

A. Yes.

X-Q. 39. And this expansion occurs without change  
of shape of the vessel, if the heat is not excessive, does it  
not?

A. Usually. I would not want to say that the rule  
was invariable, but it certainly is generally true.

X-Q. 40. Then when the vessel is allowed to cool it



resumes its normal dimensions, does it not? In answering this question you need not, unless you wish, go into fine distinctions based upon the variability of normal temperatures.

A. Yes.

X-Q. 41. Do you find any definition in Webster's Dictionary which would justify you in saying that the vessel "collapsed" in thus resuming its normal size without change of shape?

A. No.

X-Q. 42. If the resulting celluloid record is of smaller diameter than the master record, is the reproduction of sound and articulation from it absolutely the same as the reproduction of sound and articulation from the master record?

A. I am unable to say as to whether it is absolutely the same or not. For all practical purposes I think it may be so regarded. The reproduction of sound by any of these records, whether masters or duplicates, is sufficiently imperfect to render it fairly difficult to compare possible slight differences in the extent of the imperfection. It would occur to me also that a slight variation in the speed of the mandrel of the phonograph might be employed to correct any slight difference in the sound reproduction due to the slightly shrunken size of the duplicate record, although I do not understand that any such variation is undertaken in practice.

X-Q. 43. Theoretically, do you think there would be a difference under the conditions of the last question?

A. Yes, unless a correction could be made by varying the speed of the mandrel as I suggest. With a smaller record cylinder the surface speed of the record with a given rotary velocity of the mandrel would be less, and

this would tend to lower the pitch of all the reproduced tones.

X-Q. 44. Then, theoretically at least, the reproduced record, in order to be absolutely accurate, should be of the same dimensions as the master record; is not that so?

A. Yes.

X-Q. 45. And, theoretically at least, the more closely that the reproduced record approximates the master record in the matter of dimensions, the more nearly accurate will be the reproduction of sound. Is not that correct?

A. Yes.

X-Q. 46. At the risk of repetition, please state what the defendant does after shutting off the steam?

A. The practice is to close the steam valve and immediately open the air valve, so that the air pressure is admitted before the steam already in the record has time to condense and relieve the record from internal pressure. Simultaneously with the opening of the air valve, also, a little escape valve or vent is opened to permit the water of condensation to run out and to permit a sufficient leakage of air to prevent it from becoming unduly heated. The air pressure is kept on for some little time, the amount of which is in fact discovered by the time it takes the operator to attend to his other bank of printing machines. For, as before stated, the practice is to fill up one bank of machines and turn on the steam in these machines while the matrices are being removed and replaced in the other bank of machines, and then to close off the steam pressure, and then to turn on and leave on the air pressure in the first bank of machines while the top plates are being brought down and the steam is being turned on in the second bank. And then, finally, to turn off the air pressure and remove the matrices of the first bank of machines, and so on in rotation.



The air having been shut off, after perhaps two or three minutes, and the matrices having been removed and placed upon the bench, they are allowed to stand there until they are wanted for re-loading. As before stated, several sets of matrices are employed for each bank of machines, at least three sets, as I remember, and each set in turn is allowed to stand and cool while the previously used sets are being re-loaded and replaced in turn in the machines. Just how long it takes the attendant to get around to the cooling matrices, I do not remember to have noted, but at any rate the time is sufficient to permit of a cooling and contraction of the printed records within the matrices sufficient to enable them to be removed from the matrices, without damaging either the record surface of the matrix or the record surface of the newly printed duplicate. In some cases I observed that the contraction was sufficient to permit the record to drop out of the matrix when the latter was lifted. More ordinarily a slight push on the end of the record is necessary to free it from the matrix. This operation of removing the records from the matrices is aided by the fact that defendant's matrices have of late been made with a slightly tapered bore, as before stated. This taper, however, is imperceptible to the eye, being not much over a hundredth of an inch in the length of the bore.

X-Q. 47. Do you wish to be understood as saying unreservedly that in order to permit the record cylinder to be taken longitudinally from the matrix, the defendant does nothing but allow the record cylinder to cool?

A. I have described the process exactly as I observed it. The matrix, with the freshly printed duplicate inside of it, is placed on the bench and allowed to cool until the record cylinder can be readily removed from the mold.

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It must, of course, be removed endwise, since there is no other possible way of removing it. Sometimes, as I have said, the record cylinder contracts so much that it will drop out of its own accord, if given an opportunity. More ordinarily it is pushed or pulled somewhat to withdraw it. There is nothing whatever else done to the record or to the matrix in this operation of removing the record cylinders from the mold, so far as I have observed or have any reason to believe. I might say in this connection that I have only observed defendant's commercial process in the manufacture of the smaller or two-inch records. The only difference with the larger records, however, would be that with the larger records the shrinkage would be more marked and they would be more likely to drop out of their own accord.

X-Q. 48. Do you say unreservedly that according to your observation, after the record cylinder had cooled, the attendant in the defendant's process does not, as an additional step, have to collapse it slightly inward in order to remove it cleanly and easily from the matrix?

A. I do. I take it that you are using the word "collapse" here as meaning buckling or distorting. Nothing whatever of this kind is done, so far as I have observed. The attendant either hooks his finger inside of one of the end flanges of the record and pulls it out, or pushes with his finger on the end of the record and forces or permits it to drop out.

X-Q. 49. In the defendant's operations that you have observed, does the attendant, after the record cylinder has cooled, perform any act calculated either to buckle or further shrink the cylinder (if you desire to put the latter interpretation upon the word "collapse") to enable him to take the cylinder from the matrix?



A. He does not. If the record cylinder offers any serious resistance, he simply waits until it has cooled and contracted further, and to the point where it can be easily pushed or pulled out.

X-Q. 50. Then what justification have you for saying that the method followed in the defendant's factory is absolutely that of the Young patent, which says that after the cylinder has cooled an additional act is performed in order that it may be removed from the matrix?

A. My justification is this, that the practical physical operation is the same in the two cases, and is based on precisely the same physical situation. The so-called "additional act," to which you refer, is obviously as unnecessary to the Young process as to defendant's process, in view of the actual physical situation presented alike in both processes, and the reference to it in the Young specification must either be regarded as the superfluous description of an entirely unnecessary and superfluous operation, or as the inaccurate description of the necessary and inevitable operation, which, under the circumstances, must occur, and cannot be prevented from occurring. Of these alternatives I prefer the latter.

As I have before pointed out, the thin celluloid cylinder constituting the blank of the Young process is absolutely bound to contract when cooled, by reason of its inherent nature, and is absolutely bound to contract so much faster and so much more than the surrounding metal matrix can contract that it must necessarily detach itself from the surface of the matrix. This is true as a matter of theory, and it is also true as a matter of practice, as the results obtained with the thin celluloid records with which I have experimented abundantly demonstrated. As before pointed out, there is no reason why a

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very thin celluloid cylinder should fail to contract away from the surface of the matrix any more than a thicker one, such as defendant's record, or any more than a noticeably thick one, such as the records described by the Lioret British patent and the Edison patent in suit. The physical law which governs the action and causes the shrinking of the record away from the matrix is the same in the one case as in the other, and, as I have before said, no power on earth can prevent this law from operating, or the shrinking loose from occurring in either case, or in one case more than the other.

Consequently, notwithstanding the peculiar language used by the Young patent in describing the operation of removing the celluloid record from the matrix, the physical situation and the essential operation is and must necessarily be the same with the Young process as with defendant's, and no one practicing the Young process could possibly fail to discover that the celluloid record would come away both clearly and easily from the matrix when allowed to cool, without any further collapsing or shrinking but that which the cooling of the celluloid would inevitably bring about, just as it does in defendant's process. A patent specification is more than mere words, and where the fundamental actions of a process are clearly stated, the inevitable result of these actions and of the physical situation which they set up cannot be ignored, simply because some portion of the language of the specification happens to be loose enough or inaccurate enough to possibly describe an additional act unnecessary to the essential process, and which, if enacted at all, would be as useless as would be the use of the teeth in helping to pull a nail, where a claw hammer was specifically supplied for the purpose.



X-Q. 51. Do you still insist, Mr. Carter, that in the practical operation which you saw, as you have testified, the defendant absolutely followed the directions of the Young British patent?

A. I do.

X-Q. 52. In these operations did the operator insert into the matrix a celluloid blank "of the same size externally as that of the original wax cylinder upon which the record was first taken"? Please answer this question with due regard to the force of the word "absolutely" in the last question, and by "yes" or "no," if you can.

A. I have no means of knowing the absolutely exact diameter of the blanks used in the operation involved in defendant's process as I observed it, and as I have repeatedly before stated, these blanks vary more or less in diameter, as do also the matrices. Furthermore, there probably was never a celluloid blank made of absolutely the same diameter throughout its length, to say nothing of the multiplicity of celluloid blanks being of absolutely the same diameter as each other, or as any given master record. From my observation of defendant's process, as practiced and carried out, I should say there was no doubt but what in some cases the celluloid blank was as large in diameter as the original wax or master record, although on an average they were undoubtedly slightly smaller, but still of substantially the same diameter. To the best of my knowledge, therefore, I would answer your question as follows: Yes, in some cases. Practically so in all cases.

X-Q. 53. In these operations did the operator have to expand the matrix by heat to enable him to insert the blank?

A. During the entire course of the operations observed

by me in watching the practical carrying on of defendant's process of manufacture, the matrices were very noticeably heated and were consequently correspondingly expanded, and this is necessarily the case, except possibly at the beginning of the day's or half day's run. For the matrices do not have time to cool down to normal temperature after the printing operation once begins.

X-Q. 54. You have not answered the question, Mr. Carter, as you will readily see if you read it over. Please do so, and then answer it specifically.

A. If you are intending to inquire as to whether the warming or heating of the matrices was a necessary and inevitable incident of defendant's process, practiced for the purpose of enabling the blanks to be inserted because of the expanded condition of the matrices, my answer is that I do not so understand. The fact is, however, that in defendant's process, as regularly practiced, the matrices are heated and are expanded at the time the blanks are inserted in them, and undoubtedly in some instances the insertion of a particular blank in a particular matrix takes place because the matrix is heated and is expanded, where it would not take place if the matrix were not heated and were consequently smaller in diameter.

X-Q. 55. Have you ever made any attempts to practice the method of making phonograph duplicates which is described in the Lioret British patent?

A. I have never made any attempt to use a matrix made from a threaded steel cylinder, but otherwise the process employed in making "Defendant's Exhibit Carter Record No. 1" and "Defendant's Exhibit Carter Record No. 2" differs only from the process described by Lioret, in that hot air, instead of hot water, was used for heating the blank.



X-Q. 56. In practicing the Lioret method, how would you remove the electro-plated negative from the steel master record?

A. By expanding the negative, or what Lioret calls his "galvano plastic mold," by heat until it was enough larger than the steel matrix to enable them to be unscrewed. This operation is described in lines 92-97 of page 2 of the American patent to Lioret. Or, as I suggested in my direct examination, by dissolving out the steel master record by the use of acids, which would attack the steel and not the copper.

X-Q. 57. Does the Lioret British patent say anything about dissolving the master record by acids?

A. It does not.

X-Q. 58. Does the Lioret British patent say anything about unscrewing the galvano plastic mold to remove it from the master record?

A. No.

X-Q. 59. In practicing its full method of producing record cylinders for phonographs, does the defendant first form, or procure already formed, a record on a cylinder of wax or other relatively soft material?

A. Yes.

X-Q. 60. Does the defendant then render the surface of the wax cylinder electrically conductive, and electrolytically deposit metal thereon, forming a matrix?

A. Yes.

X-Q. 61. Does it then outwardly expand under pressure within the matrix a cylinder or tube of softened material, sufficiently thick to maintain its shape during and after the act of disengagement from the matrix?

A. No.

X-Q. 62. Does it finally remove the cylinder or tube by direct longitudinal movement?

A. Yes.

X-Q. 63. Please repeat, as briefly as you can, your reasons for saying that the defendant does not employ the step of outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix.

A. Because the celluloid cylinder employed for defendant's blank is so thin that it requires to be flanged in at its end in order to give it that stiffness and rigidity necessary to properly maintain its shape after its removal from the mold.

X-Q. 64. Do you find any instance in the art, prior to the Edison application for the patent in suit, of a process for duplicating ordinary phonographic records by first constructing a matrix from an original or master record, by then introducing a non-collapsible blank therein, by then expanding the blank in the presence of heat into engagement with the matrix to take an impression therefrom, by then cooling the resulting duplicate to cause it to shrink sufficiently to clear the engaging surfaces, and, finally, removing the duplicate by direct longitudinal movement?

A. Yes, the British patent to Lioret discloses this exact process, unless a distinction is to be drawn on the word "ordinary," as applied to the phonographic records duplicated. The Lioret British patent discloses a process for duplicating phonographic records, by first constructing a matrix from an original or master record, by then introducing a non-collapsible blank therein, by then expanding the blank in the presence of heat into engagement



with the matrix to take an impression thereof, and by then cooling the resulting duplicate sufficiently to cause it to shrink and sufficiently to clear the engaging surfaces and enable it to be easily withdrawn from the mold. And, as before pointed out, this withdrawal from the mold may take place in the Lioret process "by direct longitudinal movement," if the thread is sufficiently fine and the record of sufficient diameter.

The Lioret process, it is true, is specifically described as for the purpose of duplicating screw-threaded steel records, and does not mention wax phonographic records, more properly included by the word "ordinary." Obviously, however, this process is equally as applicable to the duplication of any other cylindric phonographic record than Lioret's screw-threaded steel record, if so desired, its real duplicating operation, specifically described in your question as consisting of the several steps mentioned therein, being unaffected by the application of the process to the duplication of wax master records, and the construction of matrices from wax master records, and such as your question describes, being at the time of Lioret's patent fully disclosed to the world and well understood by skilled workers in this art.

X-Q. 65. As illustrated in the drawing of the Lioret British patent, what is the approximate ratio between the depth of the spiral thread and the depth of the phonographic record engraved upon the apex of the thread?

A. There is nothing which enables me to give any very definite answer to this question. I take it that in Figures 1 to 8 of the Lioret drawings, the thread is very greatly exaggerated for the purpose of rendering the illustration clear. Probably Figure 10 more correctly shows the real size of the teeth, as they would appear in compari-

. Carter.

*Deposition of Henry W. Carter.*

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sion thereof, and by sufficiently to cause it the engaging surfaces from the mold. And, removal from the mold "by direct longitudinal sufficiently fine and the

specifically described screw-threaded steel phonographic records, and "ordinary." Obviously as applicable to ric phonographic record, if so described specifically described the several steps mentioned the application of the master records, and the master records, and being at the time of the world and well understood.

drawing of the Lioret mate ratio between the depth of the phonograph apex of the thread?

enables me to give any opinion. I take it that in regards, the thread is very fine rendering the illustration more correctly shows would appear in comparison

son with the diameter of the celluloid record, and in this figure they are shown very shallow, about a sixty-fourth of an inch in depth, I should judge. In any case, however, the depth of the sound indentations engraved on the apex of the thread would be very much less, probably not a tenth part as deep, at the maximum, and perhaps not a hundredth part as deep at the minimum. In saying this I am assuming that these sound indentations would be no deeper than those which occur in a wax master record, which I understand to run from one one-thousandth to one ten-thousandth of an inch in depth.

Adjourned till Friday, February 19, at 10 o'clock  
A. M.

Chicago, February 19, 1904. Parties met pursuant to adjournment. Present, as before.

*Re-Direct Examination by Mr. Sheridan.*

R-D. Q. 1. Does it make any difference with defendant's process whether or not the matrix is warmed preliminary to the blank printing operation?

A. No substantial difference. If the matrix was cold to start on, it simply requires a longer application of the steam in order to insure the necessary plasticity of the celluloid, which is pressed outwardly against the surface of the matrix, and which will tend to be kept cool thereby until the surface of the matrix warms up.

R-D. Q. 2. In your answer to X-Q. 15 you stated that the matrix was not heated prior to the printing of "Defendant's Exhibit Young Patent Record No. 8." Have you printed any similar thin celluloid records after intentionally heating the matrix, so that it was hot when the blank was inserted, and if so, with what difference in result, if any?



A. The thin celluloid record which I here produce and have marked "Defendant's Exhibit Young Patent Record No. 8" was printed by me, or under my direction, this morning in the matrix which I also here produce and have marked "Defendant's Exhibit Matrix 886 A." In printing this record with this matrix I followed defendant's regular process, exactly as I did in printing the thin celluloid records which I have previously introduced, except that I heated up the matrix before introducing the blank. I heated the matrix until its interior was too hot to bear my finger on it, then inserted the blank, and it went through defendant's regular printing process, first turning on the steam to soften the blank, and then turning on the air to cool it and set it under pressure. I left the air pressure on about three minutes, and when I removed the matrix from the printing machine, the blank had already shrunk until substantially free from the surface of the matrix, so that by hooking my finger into its flanged end I was able to withdraw it from the matrix without any noticeable resistance, and without distorting or changing the shape of the blank in the least.

So far as I was able to see, there was no noticeable difference between the results obtained in this case and the results obtained in the other cases, where there was no previous heating of the mold. I might also state that this matrix No. 886 A has no taper.

By MR. SHERIDAN: Counsel for defendant here offers in evidence the thin celluloid record and matrix produced by the witness, and requests the notary to mark the same "Defendant's Exhibit Young Patent Record No. 8" and "Defendant's Exhibit, Matrix 886 A."

Counsel for defendant also gives notice on the

Carter.

*Deposition of Albert D. Philpot.*

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I were produce and Young Patent Recorder my direction, this re produce and have 886 A." In print- followed defendant's printing the thin cel- lsly introduced, ex- fore introducing the its interior was too ted the blank, and it rinting process, first lank, and then turn- der pressure. I left tes, and when I re- g machine, the blank y free from the sur- ng my finger into its it from the matrix d without distorting the least.

was no noticeable dif- in this case and the where there was no ight also state that

el for defendant here elluloid record and , and requests the no- ant's Exhibit Young Defendant's Exhibit,

gives notice on the

record that any of the experiments which have been made by the witness and referred to by him in his deposition will be repeated in the presence of counsel for complainant at any time he may desire, upon making a reasonable request therefor in advance.

By MR. DYRENFORTH: The last exhibit, and all testimony concerning it, and all previous exhibits introduced by this witness, with the testimony concerning them, are objected to as incompetent, immaterial and irrelevant.

It is hereby stipulated and agreed by and between counsel for the respective parties hereto that either or both parties may use, as they desire, uncertified office copies of letters patent of the United States and foreign countries, with the same force and effect as if original or certified copies were produced, subject, of course, to correction by either party of such errors as may appear therein; and that the exhibits offered in evidence by either party may remain in the possession of said party until the day of hearing, subject to inspection by the other party at any reasonable time.

Chicago, February 23, 1904. Parties met pursuant to adjournment. Present, as before.

*Cross-Examination of Mr. Philpot by Mr. Dyrenforth.*

X-Q. 1. How long has the defendant company been engaged in making duplicate phonograph records, using the identical process that is employed at the present time?

A. The principles involved, as described in the Messer patent, have been employed since about the date of the



application for the Messer patent—about February 1, 1902.

X-Q. 2. What do you mean by saying that the principles of the Messer patent have been employed since about February 1, 1902?

A. The Messer patent made it possible for us to use a thin material with the end flanges on the record.

X-Q. 3. Since you began to use the method set forth in the Messer patent, that is, since about February 1, 1902, have you continually manufactured your celluloid record cylinder in precisely the same manner?

A. There have been minor changes for protecting and improving the record made, but the original principle has been adhered to.

X-Q. 4. Please describe the minor changes to which you have reference, and their effect.

A. One of the changes is a slight beveling of the inside surface of the matrix, thus allowing an easy and quick method of extracting the celluloid tube. Another change is the putting of a boss on the top and bottom plates, thus doing away with the necessity of reaming the records. We also engrave the top plate in order to have the name printed upon the record cylinder.

X-Q. 5. What is the amount of taper that you have given to the bore of your matrix?

A. I should say approximately one one-hundredth of an inch.

X-Q. 6. When did you introduce that change?

A. I should say about five or six months ago.

X-Q. 7. Did you introduce that change, then, in the month of July or August of last year?

A. I think it was subsequent to that time.

X-Q. 8. Can you not fix definitely the time when you introduced that change?

BY MR. SHERIDAN: Objected to as immaterial and irrelevant.

A. I cannot tell exactly the day, but should think it was some time in August or September.

X-Q. 9. Why did you introduce that change, consisting in tapering the bore of the matrix? I would like a fuller and more detailed statement than the one you have given of your reasons for making the change.

BY MR. SHERIDAN: The question is objected to as being immaterial and irrelevant, and as not proper cross-examination, and also as inquiring into the methods employed by defendant and improvements used by it, which are not germane to the issue in this case, which unduly encumber the record and look like probing after secrets of manufacture as practiced by the defendant company, which is none of complainant's business.

A. The collapsing or shrinking of the celluloid tube was a slow and tedious process, and the slight unevenness which sometimes occurs in the matrix would often scratch the surface of the same in an effort to force out the celluloid tube. We, therefore, adopted the improvement of tapering the mandrel, so that when the celluloid tube collapsed from the cooling it would more readily disengage itself from the matrix.

X-Q. 10. Are you using "collapsing" and "shrinking" as synonymous terms?

A. I have always understood them to be synonymous.

X-Q. 11. And you regarded them as synonymous terms, did you, at the time you were called as a witness



by complainant's counsel, last July, and gave testimony?

A. I have always understood them to be the same.

X-Q. 12. Where do you find any authority for using the word "collapse" to signify the slight contraction, without change of shape, which takes place in the case of the record cylinder in the method which you are now employing in the defendant's factory?

BY MR. SHERIDAN: Question objected to as being indefinite, in that counsel does not specify what he means by "change of shape."

A. I think that Webster's Dictionary will give the definition of the word "collapse" as shrinking.

X-Q. 13. If you were to distort the record cylinder by buckling or bending it inward, would that be collapsing it?

BY MR. SHERIDAN: Question objected to as calling for an opinion from the witness on matters for which he has not qualified; also, in that it is not germane to anything contained in the direct examination, and, finally, as being immaterial and irrelevant.

A. I would try to employ the language that would most fully and truthfully answer any question which might be given to me, but without the full text of the subject-matter I could not tell what term I would employ. I think the term could be employed under the circumstances.

X-Q. 14. At the time you testified in this case, under date of July 1, 1903, did you not say, in answer to a cross-question by Mr. Sheridan, that you had to bend the record cylinder slightly in order to get it out of the matrix, having reference to the method then practiced in defendant's factory, and that that was part of the process?

Question objected to as immaterial and irrelevant, and counsel is asked to repeat the question and answer referred to, and to give notice of his reason for asking this question on this matter at this time. The witness also has a right to insist on the exact and entire language of the question and answer being read to him.

BY MR. DYRENFORTH: The witness can answer as to whether or not he so testified at the time referred to.

BY MR. SHERIDAN: The witness can also refuse to answer until the original question and answer are read to him, for the reason that if it be an attempt to impeach his testimony, due notice of the same must be given on the record and witness notified in advance.

A. At the time of the examination alluded to we pushed or forced out the record cylinder from the matrix. The language used at that time to describe this method was ambiguous, and was intended to convey the impression that this method was used in order to facilitate the getting out of the celluloid tube. I do not recall the question having been asked as to whether or not the tube itself would have collapsed sufficiently if enough time had been given it to do so. I do not remember having used that language.

X-Q. 15. What is the fact as to whether or not at the time you testified in this case, under subpoena from the complainant, it was your practice to bend the record slightly in order to force it out of the matrix?

A. We did not bend the record.

X-Q. 16. What did you do?



A. We used to force the record by pushing it out of the matrix.

X-Q. 17. In referring to the suits which have been brought against the defendant company, you mention a suit brought by the American Phonograph Company. Do you understand that the complainant in this suit has anything to do with the American Phonograph Company?

A. At the present time I have understood from Mr. Dyer that there is a bitter war now waging between the National Phonograph Company and the American Phonograph Company; but I also understand that the original efforts were a combined effort to wipe out, by expensive litigation, the Lambert Company.

X-Q. 18. Where did you get that understanding?

A. Mr. Easton, president of the American Phonograph Company, personally threatened me with just such a disaster at the store of Messrs. Lyon & Healy, in Chicago, about the year 1900.

X-Q. 19. Do you recall that you executed an affidavit in this suit, under date of June 18, 1903?

A. Yes, I remember that affidavit.

X-Q. 20. Under what process was the defendant company operating at the time you executed that affidavit?

A. We were operating under the principles embodied in the Messer patent.

X-Q. 21. Did you so state in your affidavit?

A. I have not stated in my affidavit any patent or process.

X-Q. 22. In your affidavit you use this language:

"That it had begun operations under another and substantially different process, as described and claimed in an application filed in the Patent Of-

face in June, 1900, and in which eight claims stand allowed."

Has the patent there referred to since been issued?

A. The language quoted was used by me in the affidavit, and the application referred to therein has since become letters patent.

X-Q. 23. Is the patent to which you refer No. 742,454, granted to T. B. Lambert, assignor to the Lambert Company, October 27, 1903; or No. 742,455, similarly granted on the same day?

A. The parts of the apparatus in both of these patents were used by us at that time, and are substantially used now.

X-Q. 24. Your affidavit, however, does not appear to refer to two applications, and appears to apply only to the first of the patents which I have mentioned, since it states that eight claims stand allowed, which is the number of claims in the first, while the second has twenty-eight claims. Do you wish to make any explanation of your last answer, in view of this?

A. I understood my affidavit to relate to the process patent, though I was aware of the other as well.

X-Q. 25. At the time you executed that affidavit, which was on June 18, 1903, was the defendant company acting in full accordance with the Messer patent in producing its celluloid phonograms?

A. I wish to state that I am not a patent lawyer, but as near as I can arrive at a conclusion from the drawings, I think we were using the principles involved in the Messer patent.

X-Q. 26. The last question involves no legal point. The drawings of the Messer patent show an apparatus, and the specification of the patent describes a mode of



procedure with that apparatus. My question is, were you on June 1 last employing the apparatus shown in the drawings of the patent and following the mode of procedure which is set forth in the Messer specification?

A. The new principles involved in the Messer patent were followed at that time. Part of the process described in said patent is also embodied in part of the Lambert patents of October 27, 1902. We were employing a part of the Lambert patents and a part of the Messer process.

X-Q. 27. Do you clearly understand the specification and drawings of the Messer patent?

A. I think I do.

X-Q. 28. I quote the following from page 2 of the specification of the Messer patent. The quotation extends from line 33 to the end of paragraph:

"When the steam has been blown out, the next step is to close the valve y and permit cool air under pressure to remain in the record-chamber until such blank record is sufficiently cooled and hardened. Thus cooled and shrunk it is easily removed without collapsing."

What do you understand the word "collapsing" to mean there?

BY MR. SHERIDAN: Question objected to as immaterial and irrelevant, as the patent speaks for itself, and the language used is not that of the witness, but the language of either the inventor or his attorney.

A. I should think the word "collapsing" in that instance would mean "forcing."

X-Q. 29. Forcing in what way?

A. Longitudinally of the matrix.

X-Q. 30. Have you ever come across any definition of

the word "collapsing" which would justify that interpretation?

BY MR. SHERIDAN: Same objection as before.

A. I think if Webster had seen this particular paragraph he would have interpreted it in that way.

X-Q. 31. Did you have the same understanding of the word "collapse" as used by Mr. Sheridan when you answered X-Q. 54 of your deposition in this case last July?

A. I have nowhere in any testimony ever used the word "collapse" to mean bend; and the word "bend" in that case was unnoticed by me.

X-Q. 32. You did not quite understand the last question. It asks you whether when you answered Mr. Sheridan's question referred to you understood the word "collapse," used in the question, to have the same meaning that you understand it to have in the Messer patent?

BY MR. SHERIDAN: This line of cross-examination is objected to (1), in that it is not germane to anything which the witness testified to on direct examination; (2) that the Messer patent speaks for itself, and as regards the language used in its specification, the witness had nothing whatever to do; and (3) that it is for the court to determine whether or not, from all of the record presented for its consideration, the defendant company is collapsing its records before they are removed from the matrices.

A. I did not understand the word to have that meaning at that time.

X-Q. 33. What meaning did you understand it to have at that time?

BY MR. SHERIDAN: This question is objected to for the reason that the witness was subjected to one



cross-examination at the time referred to, and that such cross-examination was closed, so that it is suggested that he should not again be subjected to cross-examination on a deposition already closed, particularly in view of the fact that during such first cross-examination he testified as a witness for complainant, and had absolutely no time for preparation, in that he was subpoenaed between 10 and 11 o'clock at night to testify the next morning at 10 A. M., and further, in that witness has not qualified as an expert in patent cases.

A. I understood the word "collapsed" to mean the getting of the record out of the matrix, pushing it out longitudinally by force.

X-Q. 34. Have you come across any definition of the word "collapse" which would justify that interpretation of the word, as used by Mr. Sheridan?

Objected to as immaterial and irrelevant.

A. My own understanding of the word "collapse" would be a falling to pieces, and I was under the impression that the word was used in a mechanical sense and had a different meaning from the one ordinarily used.

X-Q. 35. In the deposition of last July, Mr. Sheridan asked you the following:

"X-Q. 59. I am talking about the step of the process which is described as 'the disengaging action.' Does the thin phonogram retain its shape during the act of disengagement, or does it bend or collapse slightly inwardly during the act of disengagement; which of these steps is true?"

To this question you answered as follows:

"A. It is collapsed slightly during the act of disengagement."

What did you mean there by the word "collapsed"?

A. Shrunk.

X-Q. 36. How was it shrunk during the act of disengagement?

A. The material itself will shrink in the process of cooling. That shrinkage itself becomes the act of disengagement.

X-Q. 37. Then when you used the word "collapse" in answer to X-Q. 59, you did not use it in the sense of pushing out longitudinally by force, did you?

A. As I have before explained, I always consider the use of the word "collapse" as applied in mechanics, and supposed that it meant either the natural shrinkage by the cooling process of nature, or the anticipation of that process by the use of force.

X-Q. 38. In the same deposition the following re-direct questions and answers appear:

"R-D. Q. 62. As a matter of fact, it does contract sufficiently to disengage the outer surface of the celluloid tube from the wall of the matrix?"

"A. It disengages sufficiently with a pressure and a slight collapsing to allow us to remove it from the matrix."

What did you mean by the word "collapsing" in that answer?

A. Shrinking.

X-Q. 39. In the same deposition the following re-direct question and answer appear:

"R-D. Q. 63. Didn't it disengage sufficiently in some or most cases so that it could be pushed out of the matrix without collapsing?"

"A. We find in most of these cases that we do not have a full print of our record."



What did you understand Mr. Dyer to mean by the word "collapsing" in that question?

A. There I understand him to mean shrinking.

X-Q. 40. Do you find your answer to that question to be consistent with such an understanding of what Mr. Dyer meant by the word "collapsing"?

A. Yes, the answer to the question would indicate that I understood Mr. Dyer to mean shrinking.

X-Q. 41. In your answer to R-D. Q. 62, in the deposition referred to of last July you say:

"It disengages sufficiently with a pressure and a slight collapsing to allow us to remove it from the matrix."

What do you mean in that answer by the words "with a pressure"?

A. Pressure means the pushing with the fingers on the top of the tube.

X-Q. 42. Why, in the manufacture of the defendant's records by the method you are employing, do you have a clearance of from one thirty-second to one-sixteenth of an inch between the blank and the wall of the matrix when the blank is inserted?

A. The clearance is provided for the purpose of allowing us to easily insert the blank celluloid tube, so that it will not scratch the matrix.

Adjourned till Wednesday, February 24. at 10 o'clock A. M.

Chicago, February 24, 1904. Parties met pursuant to adjournment Present, as before.

X-Q. 43. Have you looked into Webster's Dictionary for a definition of the word "collapse"?

A. I looked into a small Webster's Dictionary which I have in my office.

X-Q. 44. When did you look into that dictionary, and what definition did you find?

A. Yesterday afternoon about 5 o'clock. It says "a breaking down of the tissues as from old age."

X-Q. 45. Do you know what edition of Webster's Dictionary you looked into, and the date of it?

A. I do not.

X-Q. 46. Can you ascertain the edition and date by inquiry over the telephone, and if so, will you do so, and so state upon the record?

A. Most certainly.

X-Q. 47. Have you made the inquiry referred to in the last question; if so, with what result?

A. It is marked "Webster's Unabridged Dictionary," but it is an old edition which I have had for twelve or fifteen years. I bought it new. I cannot give the date of publication, because the first leaves are gone. I also had the definition of "collapse"—both as a verb and a noun—read to me over the telephone, and they were given as follows:

*Verb:* "To fall together, as the two sides of a vessel; to close by falling together, as the fine canals of vessels of the body collapse in old age; to slide or fall.

*Noun:* "The falling together, as of two sides of a hollow vessel; an extreme depression of the bodily energies."

X-Q. 48. What is the color of the duplicate phonograph records that the defendant company is putting upon the market at the present time?

A. They are black on the outside, and they are of a dark bluish color on the inside.

X-Q. 49. How long has the defendant company been



putting phonograph records upon the market of a color such as you have named?

A. About five or six months.

X-Q. 50. What was the color, or what were the colors, if there were more than one, of the phonograph records which the defendant company put upon the market previously?

A. Just prior to using the black color we made records of a dark pinkish color. We also made them of an orange color before that time; and we made them white at one time.

BY MR. SHERIDAN: Questions 48 to 50, inclusive, are objected to as immaterial and irrelevant.

*Re-Direct Examination by Mr. Sheridan.*

R-D. Q. 1. Please state, in a succinct manner, what you consider to be the merits of your phonograph records over the wax record as placed in the market by complainant?

Objected to as having no foundation on the cross-examination.

A. The wax record now in general use is very easily scratched and rapidly wears out from the continual rubbing of the point of the reproducer. The slightest jarring or stroke will crack the wax record. It will also crack from being taken, while warm, and placed upon a cold cylinder of the machine. If the records are warm and are placed on the cylinder of the machine and allowed to stay there in a cool room, the contraction of the wax is also liable to break the record.

These wax records are usually wrapped in a cotton cloth and a piece of paper is placed on the inside giving the name of the selection—whether a band, song, or so

forth. Further, the weight of the wax record is very great in shipping to different points, owing to the fact that not only does this record in itself weigh a great deal more than the Lambert record, but that it also has to be very carefully packed in a heavy, substantial case, in order to prevent breakage in transit. The Lambert record, on the contrary, can be wrapped in a piece of brown paper and sent through the mail. The name of the selection—whether band, song, etc.—is printed in plain letters on the end of the record, thus designating the character of the piece. The celluloid material is even more substantial and lasting in character than if it were a metal tube, owing to the fact that celluloid does not corrode or rust from dampness or changes of temperature. The Lambert record can be thrown upon the floor with sufficient force to make it bound up in the air several feet without doing it any injury, and the user of it is certain that in continued use no change will be observed by any wearing action from the sapphire point of the reproducer. We have a statement from one of our dealers in New Orleans that the same record has been played 12,500 times in a slot machine there, and is apparently as good at the present time as when it was first played, and he has sent me this record for advertising purposes, etc.

Aside from the saving in freight charges, owing to the lighter product of the Lambert Company, a great saving accrues to the dealer. He can also handle the record in showing it to customers without any fear of scratching or damaging it, and no possible breakage can occur from use.

The user also saves time, in that he does not have to unwrap the Lambert record from a cotton cloth and then rewrap it again after having played it for the customer.

By MR. DYRENFORTH: The answer is objected



to as containing original matter after the defendant's time for taking testimony has expired, and so much of the answer as purports to be hearsay is objected to as incompetent upon that ground.

R-D. Q. 2. Have you any letters of commendation as to the utility and superiority of your records?

BY MR. DYRENFORTH: All of the preceding objections entered in this alleged re-direct examination are repeated as to the last question.

A. We have several hundred, and I here produce some samples of them.

BY MR. SHERIDAN: The letters just produced by the witness are here offered in evidence, and the notary is requested to mark the same "Defendant's Exhibit Letters of Commendation."

BY MR. DYRENFORTH: The letters named as forming the exhibit are objected to as incompetent, immaterial and irrelevant, both as to their contents and upon the grounds stated in the preceding objections entered in the course of this alleged re-direct examination.

R-D. Q. 3. Will you kindly read these letters, dates, titles, subject-matter and signatures into your answer?

Same objection as before.

A. I will. They are as follows:

E. F. WAITS,  
Dealer in

Everything Pertaining to Jewelry and Optical Trades.  
CORINTH, MISSISSIPPI, Nov. 13th 1903.

LAMBERT CO.,  
Chicago, Ill.

*Dear Sirs:*—I enclose a list of records which you will please forward it to me by first express. DO NOT SUBSTITUTE. You may also send me one of your genuine sapphire points, to fit an Edison phonograph.

While I think my selection of records is just what I want, in case there are some I do not like, I will return them by first express, prepaid, to be exchanged. I think I can do a good business with your records.

They are as good as the Edison, if not better, & with the great advantage of being indestructible.

Yours truly,

E. F. WAITS.

# LEHIGH VALLEY RAILROAD.

CHERRYVILLE, N. J. Nov. 23rd, 1903.

LAMBERT CO.

*Gentlemen:* I have some of your indestructible records that I bought in Jersey City and have tried to get some more here but cannot, so write you for record list and your prices also to know if you would like to have an agent in this county. If so I would like to have the agency as I know several people who desire to get some of your records as they are the best.

Hoping to hear from you soon,

I remain,

Yours Respt.

OLIVER HOFFMAN,

Cherryville.

Hunterdon Co. N. J.

# UTICA ELECTRIC and PHONOGRAPH SUPPLY HOUSE,

Contractors

For Electrical Wiring of All Kinds.

Talking Machine Parts.

Edwin A. Batchelor.

UTICA, N. Y. Nov. 23, 1903.

LAMBERT INDESTRUCTIBLE RECORD CO.,

Chicago, Ill.

*Gentlemen:*—We have received the records that you sent us in exchange for the ones that we returned to you, and wish to thank you for the same. We have a proposition that we would like to put before you. Upon looking over your records that you have returned to us, we notice



that you have changed the color to black. This is an improvement in their appearance; but this is not the only change that we have noticed. You now have the best record that we have ever heard, they are loud and full of volume.

If we send to you an order for 1000 of your records agreeing to pay for and have shipped 500 at once and the other 500 to be shipped to us Feb. 1; 04, or before if so desired by us. Last lot to be paid for when ready for shipment to us, and that we bind ourselves to taking these records from you as per above statement. Will you accept our order in this way?

We would like to add to the above that if we take these records to job that you will refer all the dealers for a reasonable distance from here to us, should there be any that wish to purchase your goods and write to you for the same, also, that you will not sell any of your goods in this city.

If you are willing to accept our proposition please let us know by return mail. We are in very much of a hurry as it is near the holidays, and it would not do to have them sent to us by express, as the rateing is too high from Chicago to Utica.

Yours very truly,

J. M. S.

E. A. BATCHELOR, Mgr.

PO'KEEPSIE, N. Y. June 6th 1903.

To the LAMBERT Co.

*Dear Sir,* I drop you a line asking you if you would kindly send me your price lists of the Lambert Indestructable Phonograph Records as I heard them in New York City and I think they are the best record on the market to-day. Please send me your wholesale price, and the jobber's price also. If you will send a sample or two, I will stand the expense, as I would like to obtain the agency here in this part of the country as I think they are far ahead of all others.

And I know they will sell good here.

Oblige me if possible.

Yours truly,

MR. WALTER A. DE GROFF,  
No. 155 Mill St.,  
Po'keepsie, N. Y.

*Deposition of Albert D. Philpot.*

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L. W. COOKE'S MUSIC HOUSE,  
Watertown.

*Pianos, Organs and Sewing Machines.*

Sold for Cash or on Payments.

WATERTOWN, SOUTH DAKOTA, Dec. 4th, 1903.

LAMBERT COMPANY,

Chicago, Ill.

12 Sherman St.

*Gentlemen:*—Enclosed herein find stamps to amount of 60c, which will balance my account for the sample Record you sent me. You did not send the one I wanted, but it shows the goods all right. I am sending to Kansas City for a dozen of these records, for a customer, and I think I may send for another dozen soon for another party. Your records are O. K.

Yours truly,

L. W. COOKE.

by—McIntyre.

JOHN DANIELS MUSIC CO.,

Dealers in

Pianos and Musical Merchandise of All Kinds.

LINTON, IND., Dec. 7, 1903.

LAMBERT COMPANY,

Chicago, Ill.

*Gentlemen:*—I was induced by your agent here, Mr. Daniels, to try your Indestructible Records and accordingly placed an order for fifteen Concert Records. And must say these Records are unsurpassed for their great volume and sonority of tone, and possess none of the undesirable harshness found in "other" Records. From this on I shall ever be a user of the Lambert Record.

Yours truly,

WILL ELSON.

From John D. Freeman,

Simcoe,

Box 205.

Ontario.

SIMCOE, Dec. 12./03.

LAMBERT Co.,

Chicago.

*Gentlemen:*—I find that Lambert Records work far

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DE GROFF,  
55 Mill St.,  
Keepsie, N. Y.



better on my Phonograph than any other, but there are a number of Records that I cannot get from Imperial Music Co. Toronto, and I do not know whether you have them in stock or not. They are Columbia & Edison Records, but I hope you have the same in Lambert Records, as follows:—

Columbia R. at (25)c twenty-five cents:

31666—Address of Pres. McKinley at Pan American—Len Spencer.

31654—Hymns and Prayer from Funeral Service of McKinley.

1603—God Save the King. Gilmores Band.  
Edison R.

8102—Ingersoll at Tomb of Napoleon, }

8265—Talmage on Miracles }

8155—23rd Psalm & Lord's Prayer. }

Len Spencer.

Please let me know if you have them, and oblige,

Yours very resp.

JOHN D. FREEMAN.

MOLINE, ILL. 12/15—1903.

LAMBERT COMPANY,  
Chicago, Ill.

*Gentlemen:*—I should be pleased to receive your Catalogue & Price list of Indestructible Phonograph Records. I have an Edison Machine, and the Records are so easily broken, I would like to get something better.

Yours truly,

J. C. FULLMER,

Box 267,

Moline, Ill.

C. BOUZOID & CO.

Direct Importer and Indent Agent.

314 Queen Street,

AUCKLAND, N. Z. Dec. 24th 1903.

THE LAMBERT Co.

Chicago.

*Gentlemen,* Received your reply in answer to our enquiry re Agency of Records, and must thank you for

favor you extend to us. We were not aware at time of our writing that you had a factory in London. We have written to your branch there asking them to deal with us, the same as you are willing to do. As you say the Agency would not be exclusive without the London people. We feel inclined to run yours in place of the wax, as we consider they are capable of displacing that make entirely. Would you kindly pass your London people a word in our favor, and in the event of securing the sole agency we will do our utmost to dispose of large quantity. Meanwhile please send 400 records, standard size (assorted) so as we can send them round to our customers, also send plenty of display cards and catalogues to liven things up a bit. Send also code book. Can you allow any better discount if we order in lots of 1000 or more at a time? Send also some sapphire points and directions how to put them on different makes of machines.

Wishing you compliments of the season.

We remain,

Yours truly,

CHAS. BOUZAIID & Co.

per J. U.

NASHUA, N. H. Dec. 31st 1903.

LAMBERT Co.,

Chicago.

*Gentlemen:*—I receive your record slips *regular*; also your *large* Record list for December. I sent for some of your records last week. Receiving them yesterday was disappointed, as I sent for the most on Dec. list and did *not get one of them*. I sell quite a lot of Edison and Columbia Records and see the possibilities of your Records. Besides their indestructible qualities, there is no freezing on, or getting loose when partly played through, or in summer getting soft and faint through heat. Points to be appreciated.

I am glad to note improvements in some of the latest of your Records. Don't stop! make them the best record on the market in tone quality. Don't make the mistake in cutting short a song, or Band Record. The record



buyer wants all possible for *his money*. The more you record on a record the better it takes with the public as long as it is *recorded good*. Quality first, quantity second.

Can Lambert records be sent through the mail without *injury*? If so, what is the postage per doz. or each? Keep me posted on all improvements.

If safe to *do so*, could you send records to me by mail. I pay the postage at doz. rates \$3.00?

Do you think one of your sapphire points would be an improvement over the Model C reproducer button point?

Yours truly,

CHAS. A. CLIFFORD,

R. D. No. 2, Nashua, N. H.

TAUNTON, MASS. Jan. 5, 1904.

THE LAMBERT CO.,

*Dear Sir,* Your catalogue received, and enclosed find One Dollar, for which please send me Numbers 874 and 859. If these are not in stock you may substitute No. 857 and 873. If these are satisfactory you may expect a larger order from me. Also as there is no place here which handle your goods, I would like to have you state if you would allow me anything for getting orders from other parties, as I think the goods would find a ready sale here, as there are a very large number of machines in use here and the owners are universally complaining of the easy way the common wax records are broken and worn.

Hoping to have an early reply.

I remain,

Yours respectfully,

ARTHUR L. FOUBERT,

161 Broadway,

Taunton, Mass.

UNIVERSITY OF PENNSYLVANIA.

Department of Archaeology.

Free Museum of Science and Art.

Section of General Ethnology,

W. H. Furness, 3rd M. D., Curator,

G. B. Goodrich, Sc. D., Assistant Curator.

PHILADELPHIA, January 7th, 1904.

*My dear Mr. Philpot,* The Caroline Island indestruct-

Pot.

Deposition of Albert D. Philpot.

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Nashua, N. H.

Jan. 5, 1904.

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FOUBERT,  
51 Broadway,  
Taunton, Mass.

VANIA.

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ible records arrived safely and give me thorough satisfaction—indeed it seems almost as if some of them were even more clear than the originals. Roll numbered 511 however is the only one that is not satisfactory and the fault seems to be that it is not a perfect cylinder and the needle of the speaker touches it only in the high places, and gives it a wavy intermittent effect. Can this be remedied in these two impressions, or will it be necessary to cast the celluloid over again. Trusting that you will make this right I enclose my check for \$120.00.

I sincerely hope that no one who was near and dear to you was in the ghastly catastrophe which has made the whole World shudder.

Believe me very truly yours,

WM. H. FURNESS, M. D.  
1906 Sansom Street, Philadelphia.

PENNINGTON, N. J. Jan. 2, 1904.

THE LAMBERT Co.,  
Chicago, Ill.

Gentlemen:—We are going to favor you with an order for "Lambert Records" they are the best. Please send us the following, viz:—by U. S. Express.

513	520	551	559	574	794	798	804	810
825	830	851	856	866	869	871	872	874
880	885	884	842	907	910	915	955	968
989	981	977	1016	796				

Send balance of 18 from last lists, we have no late lists to select from,—some you think will please the buyers, something new.

Enclosed find P. O. M. O. for same, less discount as per agreement. Will send for a larger lot next time. Wishing your Co. a Happy New Year and lots of them,

We beg to remain,

Yours very truly,

H. M. STOUT & Co.  
Pennington, N. J.



JAMES I. LYONS

Jobber and Dealer in

Talking Machines, Records, Horns and Supplies

NEW ORLEANS, LOU., Jan'y 19/04.

THE LAMBERT CO.,

Chicago, Ill.

*Gentlemen:*—We are sending you in same mail a record which has run 12,500 times in a "Penny Wonderland" here and taken in \$125.00. We consider it a great ad. Please send us a supply of catalogues and supplements—our latest is October, and your magazine advertisements are bringing us almost daily requests for catalogues. Your prompt attention to this would prove of mutual benefit.

Yours truly,

L. S. GARDNER.

LARNED, KANS. Jan. 26, 1904.

LAMBERT & Co.,

*Dear Sirs:* Inclosed please find \$ .50 (fifty cents), for which please send me one of your sapphire reproducer points and a diaphragm glass. The diaphragm glass and point is wanted for Columbia Phonograph Reproducer to use on Lambert P. records, indestructible. Please send by mail, and oblige

A. L. COOPER,

Larned, Kans.

P. S. Please send me one of your latest catalogues, and oblige

Your friend,

A. L. C.

LARNED, KANS. Jan. 26, 1904.

I have used your records in my entertainments, and they have given perfect satisfaction; they are loud and clear, with a smooth tone and a penetrating tone,—gives loud clear reproductions, sounding a clear bell tone in songs, bands and quartettes that I have used and are better records than any I ever saw or held, and can conscientiously speak in confidence, for I know from a little

## Deposition of Albert D. Philpot.

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experience. Those wishing a line from me would please inclose stamp.

Yours Respectfully,

A. L. COOPER,  
Larned, Kans.

P. S. If this testimony is any good to you, you can use it if you wish.

R. D. PECK,  
Jobber and Dealer in  
Talking Machines, Records, Horns and Supplies.  
DANVILLE, WIS., Jany. 31st. 04.

LAMBERT RECORD CO.,  
Chicago, Ill.

*Dear Sir:*—Having been in the Machine business for some time handling the Thomas A. Edison, Victor, and in fact all makes of Machines, have of late heard of the celebrated Lambert Indestructible Record. Gentlemen will you please arrange to put my name on your list and send me list of records monthly as they are completed and also send me circulars on this make of Record; if same is as advertised it will be a joy forever with the lovers of the Phonograph world.

Gentlemen if you will please send me the following Record by return mail Number 874 Always In the Way.

Send me bill of same and I will remit to cover same. Wish to introduce this record in preference in this locality in preference to the wax record which is very easily broken. Hoping this request will meet with your demand.

Yours very truly,

By R. D. P.

R. D. PECK.

GENEVA, N. Y. 1-31-04.

LAMBERT CO.

*Dear Sirs:*—I am in receipt of your kind letter offering to replace the defective record. I thank you very kindly, but I think I will not return it, as I cared the least for this one. I consider the other two worth all I paid for them all. I have compared your records with the Edison, —the same song, sung by the same man, and I consider

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S. GARDNER.

in. 26, 1904.

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L. COOPER,  
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yours superior in tone and clearness. I do not speak of the one record with the thought of complaining, for as I told you I was well pleased with them. I have Edison Records with greater defects than this one. I have dealt through the mails with a great many firms, and I have found it a very unusual thing to find a firm as honest, prompt and courteous as I have found you to be. I have found one can't tell much about the records by the titles, and as I have learned your Records are sold in Rochester, I will get them there, as I go there quite often. Again thanking you, I am

Gratefully yours,

CHAS. CRYSLER,  
357 Castle St.,  
Geneva, N. Y.

MABON COAL MINES,  
Inverness Co. C. B. Canada.  
Feb. 1st 1904.

GENTLE.

*Dear Sirs,* Would you be kind enough to send me Wholesale Price List of your Indestructible Records. I am agent for the Edison Machines & Records. Your Records far exceed anything in the market, as I got one of them from a firm in Toronto and can speak highly of it. I think yours will be able to knock Edison & Columbia out of the market altogether once the public know about them. If you think this worth a reply

I remain,

Yours respectfully,

RICHARD SOMMERVILLE.

R. D. PECK,  
Jobber and Dealer in  
Talking Machines, Records, Horns and Supplies.  
DANVILLE, WIS. Feby. 3rd 04.  
LAMBERT RECORD CO.,  
Chicago, Ill.

*Dear Sir:*—Your Records received this morning and very glad to receive so prompt reply. They are the coming Record and will soon be sold the world over in prefer-

ence to the wax record. Have tried same and find them equal to the world known Edison record. Please arrange to send me every month list of records as they are turned out. Let me say a word of praise for them, Gentlemen this is the coming record, it won't be long now and the wax record will be done away with as these records are far ahead of anything manufactured up to the present day. In the future Gentlemen you shall be favored with my orders for all records. Thanking you very kindly for your favors done. Please find enclosed Express Money Order for 25 cts. account of bill for record as per attached bill.

Yours Very Truly,

Dctd. By R. D. P.

R. D. PECK.

O. L. NOLEN BILL POSTING AND ADVERTISING CO.

MURFREESBORO, TENN., Feby. 6, 1904.

THE LAMBERT Co.,  
Chicago, Ill.

*Gents.* Your favor of 4th inst. to hand. I think your dis. on records in large lots liberal. I also saw your letter to Mr. Nolin. As before stated Mr. Nolin is well prepared to handle and advertise them, and has a fine prospect for future sales. He desires the sole agency in this community, which I think would be best for all parties. I will, however, continue to assist in talking them up. I play them at home almost every day for visitors, and without exception they pronounce them the best records they ever heard.

Again I say it will be best Mr. Nolin have sole agency here.

Very truly yours,

B. F. PATY.

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Feb. 1st 1904.

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THE W. D. GORDON COMPANY,  
Expert Merchandise Auctioneers.  
Office, 841 Guaranty Building.  
Minneapolis, Minn.

Feb. 16, 1904.

THE LAMBERT CO.,  
Chicago, Ill.

*Dear Sirs:*—We have been using your indestructible records on our Edison Grand Concert Machine, and they are certainly O. K. They give entire satisfaction, and what is of as great importance to us (as we travel all over the States holding Auction Sales) we do not have any more loss thro the records being broken. We save from \$10. to \$20. a month by having your records.

We send by this mail our reproducer for you to fit with your special point. Please send it to my home, as under, with bill, and oblige,

Yours truly,

W. D. GORDON,  
1805 4—Av. So.  
Minneapolis, Minn.

It is hereby stipulated and agreed by and between counsel for the respective parties hereto that, subject to all the foregoing objections, the original letters which have been copied into the witness' answer may be retained by the defendant company subject to inspection by complainant's counsel at any reasonable time, and that the copies thereof may be used with the same force and effect as if the original letters were produced.

BY MR. SHERIDAN: Attention is called to the fact that this prolonged session of defendant's testimony is not due to any delay caused by defendant or its counsel. When defendant's counsel closed his direct examination, complainant's counsel requested that the cross-examination be postponed to a date definite

and which was later than the time limit set for defendant to complete its proofs, which request was acceded to. Defendant's counsel therefore insists that as all of this testimony is taken *nunc pro tunc* the right to offer these exhibits was also reserved *nunc pro tunc*.

BY MR. DYRENFORTH: I dislike to enter into any altercation with defendant's counsel upon the record, but it is only proper to say that delays have been had in the matter of the cross-examination to suit the convenience of defendant's expert as well as the convenience of complainant's counsel.

R-D. Q. 4. Do you know who the present owner of the Lioret United States patent No. 528,273, of October 30, 1894, offered in evidence in this cause, is?

Objected to as immaterial.

A. I am informed that it is now owned by the Lambert Company.

Defendant's counsel herewith offers in evidence a certified copy of the assignment from Henri Jules Lioret to the Lambert Company of the entire right, title and interest in and to the Lioret United States patent above referred to, and the notary is requested to mark the same "Defendant's Exhibit Lioret Assignment."

BY MR. DYRENFORTH: The exhibit named is objected to as incompetent, irrelevant and immaterial, and further as being improperly introduced at the present time, first, as having no foundation in the cross-examination; and, secondly, as being in the nature of original evidence introduced after the defendant's time has expired.



R-D. Q. 5. Why did the Lambert Company authorize the purchase of this patent?

Same objection.

A. Because we were informed by our patent counsel that the Lioret patent covered original principles contained in both the Edison and Lambert patents, and that we might be quoted as infringing the same.

I, Annie C. Courtenay, a Notary Public in and for the County of Cook, in the State of Illinois, and Special Examiner by agreement, hereby certify that all the proceedings aforesaid were had as stated in the cause named in the caption hereto; that on the 22nd day of January, 1904, and subsequent days mentioned in the foregoing depositions, I was attended by Mr. Philip C. Dyrenforth, counsel for complainant, and Mr. Thomas F. Sheridan, counsel for defendant, and by the witnesses Albert D. Philpot and Henry W. Carter; that before giving their depositions the said witnesses were by me duly sworn to testify the truth, the whole truth, and nothing but the truth in said cause, and that their depositions were taken down by me in typewriting from their statements, and afterwards read over and subscribed by them as and for their depositions in said cause; and that I am not related to or of counsel for either of said parties, or in any way interested in the result of said suit.

In testimony whereof I have hereunto set my hand and affixed my notarial seal this 26th day of February, 1904.

ANNIE C. COURTENAY,  
Notary Public.

[SEAL.]

UNITED STATES PATENT OFFICE.

Thomas B. Lambert } Interference No. 20,534. Record Cylin-  
vs. } ders for Phonographs and Methods of  
Thomas A. Edison. } Producing the Same.

ORANGE, NEW JERSEY, February 21st, 1901.

Testimony on behalf of Edison, taken this 21st day of February, 1901, beginning at 11:30 A. M., before Alphons Westee, a notary public, at the laboratory of Thomas A. Edison, Orange, New Jersey, pursuant to the annexed notice.

Present—Frank L. Dyer, Esq., for Edison; Thomas F. Sheridan, Esq., for Lambert.

THOMAS A. EDISON.

THOMAS A. EDISON, a witness produced on his own behalf, having been duly sworn, in answer to questions proposed by Mr. Dyer, deposes and says as follows:

1 Q. What is your name, age, residence and occupation?

A. Thomas A. Edison; age, 54; residence, Llewellyn Park, Orange, New Jersey; inventor.

2 Q. You are the same Thomas A. Edison who filed the application involved in this interference, are you not?

A. I am.

3 Q. The method involved in this interference is thus defined by the Patent Office:

“The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing



metal thereon, forming a matrix, and then outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement."

When did you first conceive of this method?

A. About October, 1888.

4 Q. How do you fix this date?

A. By a caveat which I filed in the Patent Office October 26th, 1888.

Certified copy of so much of the caveat in question as relates to the present process is offered in evidence, and marked "Edison Exhibit Extract from Edison Caveat," and a copy of the complete caveat is offered for the purposes of cross-examination.

5 Q. After you conceived the invention of this process, what did you do with it?

A. I went to work at it to put it in a commercial shape, turning it over to an assistant to put it into commercial shape.

6 Q. To whom did you turn the matter over?

A. To a man by the name of Schulzberg.

7 Q. Is Schulzberg living now?

A. No, sir; he is dead.

8 Q. When did Dr. Schulzberg first carry out the process under your direction?

A. In October, 1888.

9 Q. How did Dr. Schulzberg make the molds or matrices?

A. By an electro-vacuous deposition of the vapor of gold on the surface of a phonographic record cylinder, and then placing the same in an electrolytic deposition

bath of copper, and plating a thick coating of copper over this cylinder, and finally dissolving or melting out the original waxlike record. This shell was backed up by being turned and put into a stronger shell, and into this was placed a smooth blank cylinder of the ordinary commercial thickness, at a low temperature, and then by heat and pressure the same was expanded so as to fill the indentations composing the record on the matrix. Afterwards the whole was chilled down to a low temperature, the waxlike material contracting in a greater ratio than the matrix permitted it to free itself from the same, and was taken out longitudinally.

10 Q. I wish you would examine the several pieces of apparatus on the table in front of you and point out one of the original molds made in October, 1888, by Dr. Schulzberg?

A. The one I now hand you is one of the original molds, as I remember it, as made by Dr. Schulzberg under my direction.

The mold referred to by the witness is introduced in evidence and marked "Edison Exhibit Original Schulzberg Mold."

11 Q. Will you also please point out, if possible, one of the original duplicate copies made in October, 1888, by Dr. Schulzberg?

A. The one I hand you was made by Dr. Schulzberg from a matrix in 1888, by the expansion process in controversy.

12 Q. How do you identify this so positively?

A. By the nature of the material of the cylinder. A short while after that was made we adopted the other material for making cylinders.

The duplicate copy referred to is introduced in



evidence and marked "Edison Exhibit Original Duplicate Copy."

13 Q. After Dr. Schulzberg practically carried out the process in October, 1888, what was then done with it?

A. One of my assistants, Mr. Charles Wurth, was put at work also with Schulzberg on working up the methods for a commercial production of the duplicates.

14 Q. When did Mr. Wurth start in on this work?

A. In the spring of 1889.

15 Q. Has he been practically, continuously working on the process from that time until the present time?

A. Yes, sir; nearly the whole of his time.

16 Q. And I presume he has made a large number of these molds and has produced copies therefrom by an expanding process, as you describe above?

A. Yes, sir; he has produced a great many matrices, and has produced a great many copies from the matrices by expansion, which have been used commercially.

17 Q. Why was it necessary or desirable for Mr. Wurth to make such a large number of these matrices and copies during this time?

A. To get it so that they could be manufactured cheaply in large quantities and so that the matrices would be very perfect and without a flaw. On account of the expense of making these matrices, and the idea which I had in my mind that they would be permanent, and the large investment required to carry a large stock of these, it was essential that the records should be very perfect. The process necessary to make a perfect matrix and the reproduction of duplicates from these matrices commercially and cheaply and perfectly is a matter of extreme difficulty to preserve the exact quality and prevent any slight irregularities and extraneous noises due to imperfections.

18 Q. But so far as the process is concerned, it is just the same now in a broad sense that it was when Dr. Schulzberg carried it out in 1888?

A. Just the same.

19 Q. And Mr. Wurth's work from 1889 up to 1898, when you filed your application, was directed only towards the improvement of small details to make it commercial?

A. That is correct; commercial and perfect.

20 Q. How perfect were the duplicate copies made by this process under your direction as early, say, as 1891?

A. They were perfect as far as quality was concerned, but there was some scratching of the cylinder which was objectionable, and they were not quite as loud as the matrix should have given them, and the expansion of the material in heating was not exactly as we desired it.

21 Q. You filed your application for a patent in March, 1898; did you consider the process commercially perfected at that time?

A. The process of expanding the cylinder in the matrix and withdrawing it was perfected long before that, but the process as a whole was perfected by that time as a commercial proposition. By this I mean that the process was so far perfected that I was able to make absolutely perfect duplicate copies at a price that would make the process worth carrying out in competition with other methods. So far as the making of the mold and the expanding of a blank within the mold and the withdrawing of the blank longitudinally are concerned, they were just as perfect in October, 1888, as they are now.

22 Q. What are the duplicate copies made by this process at the present time used for?

A. They are used as masters in the mechanical du-



plicating process, because they are so perfect that they are indistinguishable from the original master.

23 Q. How often did you consult with Mr. Wurth during his experiments?

A. Several times a week. Whenever he would meet with a difficulty, he would come to me, and I would make suggestions which he would carry out.

24 Q. So that you are able to say of your own knowledge that Mr. Wurth had been working practically continuously on this identical process from early in 1889 up to the time you filed your application in March, 1898?

A. Yes, sir; practically continuously. I believe my books will show that.

*Cross-Examination by Mr. Sheridan.*

25 X-Q. Did you ever make any celluloid records, Mr. Edison?

A. I have lately.

26 X-Q. When did you first make a celluloid record?

A. I don't remember; I think, perhaps, about a year or a year and a half ago.

27 X-Q. Have you tried any of them?

A. Yes, sir.

28 X-Q. With what success?

A. Worked fairly well; a little scratchy.

29 X-Q. You didn't make any celluloid records, though, as early as 1889 or 1890?

A. No, I don't remember that I did.

30 X-Q. All the records you made at that early date, or prior to 1897, were records that were made of a wax-like substance; is that true?

A. I think they were, but still I am not sure, for we tried using a number of materials, but I don't remember using celluloid at that early date.

31 X-Q. Now, you speak of making an electro-deposit in a vacuum on the waxlike master. That practically made the matrix, did it not?

A. That acted as a base whereby we could make the matrix.

32 X-Q. The electro-plating deposit was a mere backing?

A. It was a backing, because the vacuous deposit was excessively thin, and intended to be so.

33 X-Q. In expanding these phonograms to get the impression from the matrix, you didn't do any preliminary softening, did you?

A. Yes, sir.

34 X-Q. How did you soften them?

A. By heating.

35 X-Q. Did you heat them to soften them?

A. Yes, sir; heated the matrix, mold and all.

36 X-Q. That is, to soften the record?

A. Yes, sir.

37 X-Q. Did you read the affidavit made by Mr. Wurth in this case while it was pending in the Office?

A. No, sir; I don't remember seeing it.

38 X-Q. In this affidavit made by Mr. Wurth, he says that this heating was done for the purpose of expanding the record only.

A. Well, we used the expansive force of heat to produce pressure, as well as using a mandrel, and also used the heat for the purpose of softening the brittle material so that it would take the impression; flow in a viscous manner.

39 X-Q. There was no preliminary softening, though, before the phonogram was placed in engagement with the mold?

A. No, sir.



40 X-Q. Mr. Wurth further said in that affidavit that this heating does not in any way affect the brittleness of the blank, nor does it make it plastic; is that true?

A. No, sir.

41 X-Q. It is not true?

A. No, sir; that is his theory.

42 X-Q. There is on file in this case, Mr. Edison, a statement signed by you that you read this affidavit of Mr. Wurth and agreed with him?

A. That may be true. I probably just glanced over it as a matter of routine of business, as I have thousands of papers to sign; probably didn't pay much attention to it—supposed that Mr. Wurth would state the case correctly. He is only an assistant of mine, and knows nothing about the theory of the thing; merely carries out my directions.

43 X-Q. Well, didn't you know, Mr. Edison, at the time he was making this affidavit in this case that it was for the purpose of overcoming the Lioret and the Young references?

A. I never heard of those people.

44 X-Q. Then you never saw those references?

A. No, sir; I don't attend to the patent business; that is done by my attorney.

45 X-Q. Were you ever concerned in any litigation on this subject with the American Graphophone Company?

Objected to as irrelevant.

A. No, sir; I don't remember ever being.

46 X-Q. You knew, of course, all the time between 1888 and 1898 of the value that process would have in the arts, did you not?

A. I knew in the last two or three years of its value.

but in 1888 the phonograph was not commercial, and the company which attempted to commercialize it went into bankruptcy. It was not until seven years later that the public became a buyer of phonographs, but I always believed that they ultimately would appreciate the invention, and, therefore, I worked continuously on this process, with a view that some day it would be of great value, when the public did take hold, which they did in the last two or three years.

47 X-Q. You took out a great number of patents between 1888 and 1898, did you not?

A. Yes, sir.

48 X-Q. You don't know just how many you took out in that period of time, do you?

A. No, sir.

49 X-Q. It is safe to say, however, that you took out a couple of hundred, two or three hundred?

A. Well, I should say I have taken out a hundred?

50 X-Q. I have a list here of forty-one patents that were taken out by you between March 11, 1890, and January 12, 1897, relating to just this particular art. Do you think that is correct?

A. I suppose it is correct. I see no reason why it is not.

51 X-Q. During all that time, your income was sufficient to take out additional patents if you so chose, was it not?

A. Yes, sir.

52 X-Q. Did you ever use plumbago as an electrical conducting material on the wax record?

A. Yes, sir.

53 X-Q. And then electro-plated directly on to the plumbago?

A. Yes, sir.



54 X-Q. When did you do that first?

A. I think that was the first thing I tried; away back in the early phonograph days.

55 X-Q. Then you abandoned that and took up the electro-vacuous deposit?

A. Yes. The plumbago didn't give a smooth record, as I desired.

56 X-Q. About what temperature did you raise the phonogram to when you were expanding it in the mold?

A. I don't remember now, but I can get that from my assistant who kept the records.

57 X-Q. How soft do you suppose those wax phonograms were when you were heating them?

A. Soft enough to flow viscously and fill the indentations on the matrix, or the record on the matrix, under pressure.

*Re-Direct Examination by Mr. Dyer.*

58 Re-d. Q. How thick is the preliminary electro-deposit which you apply to the original record?

A. Well, it is very hard to say, but I should make a guess that it was about 1/100000 of an inch thick, as blue light can be seen through the gold.

59 Re-d. Q. And I understand that that vacuous deposit is used only as a conducting coating for the coating for the electrolytic deposit?

Question objected to as leading.

A. Yes, sir.

60 Re-d. Q. About how shallow is a phonographic record groove?

A. A thousandth of an inch will turn off the loudest record, so that nothing can be heard after the thousandth of an inch is taken off.

61 Re-d. Q. I understand you to mean that a phonographic record is no deeper than a thousandth of an inch, and possibly less.

A. It is generally less; I refer now to the loudest.

62 Re-d. Q. When you introduced the cylindrical blanks into the matrix, how close a fit did you secure between them?

A. Before expanding, do you mean?

63 Re-d. Q. Before expanding.

A. We try to get it as close as possible without scratching the surface in putting it in.

64 Re-d. Q. So that in order to take an impression the blank requires to expand only to a very slight extent?

A. Very slight, yes.

65 Re-d. Q. When you say that the blanks are softened so as to flow viscously, do you mean to say that their surface flows, or that the blank as a whole flows?

A. The blank as a whole.

*Re-Cross Examination by Mr. Sheridan.*

66 Re-x. Q. When was Mr. Lambert's claim now the issue in interference first called to your attention; do you recollect?

A. I don't remember ever seeing it.

67 Re-x. Q. Then the claim was put into your application, after the Lambert patent was granted, without your knowledge?

A. I don't remember it.

Adjourned until 2 P. M.



Resumed after lunch.

*Re-Direct Examination by Mr. Dyer.*

68 Re-d. Q. In your application, Mr. Edison, you state that it is possible to secure duplicate copies without the use of a mandrel, by introducing a cylindrical blank in the mold, and allowing it to expand by heat alone. Did you ever carry such a process out?

A. Yes, sir.

69 Re-d. Q. If such a process were carried out, how plastic would the blank be to permit it to retain its body during the act of engaging the mold?

A. Well, it is a question of degree. If it was putty plastic, it wouldn't give sufficient pressure; if it was plastic like ice, it would be stiff and still be able to have enough plasticity to flow into the record, which is only, perhaps, a thousandth of an inch. The cylinders we have that were used, while they are brittle and can be broken at 100 degrees; still, if submitted to a bending action, which is not sudden, they will distort and bend without breaking, but break easily with a blow, like glass. Their viscosity is increased by heat, like all other materials.

Signature waived by consent.

CHARLES WURTH.

CHARLES WURTH, a witness produced on behalf of Edison, having been first duly sworn, deposes and says, in answer to questions by Mr. Dyer, as follows:

1 Q. What is your name, age, residence and occupation?

A. Charles Wurth; age, 60; residence, Orange, New Jersey; experimentalist in the Edison Laboratory.

2 Q. When did you enter the laboratory in this capacity?

A. In November, 1888.

3 Q. Have you ever had anything to do in the laboratory with work on duplicating phonograph records?

A. That was the greatest part of my work since I have been here.

4 Q. When did you first actively take up work on duplicating phonographic records?

A. That was in the winter from 1888 to 1889.

5 Q. Under whose direction did you do this work?

A. Professor Schulzberg had charge of it then.

6 Q. Did Mr. Edison have anything to do with it?

A. I guess he did, because he came to look after it and gave suggestions.

7 Q. Did you ever do any of this work independent of Dr. Schulzberg?

A. Well, after Dr. Schulzberg left it was all in my sole charge.

8 Q. When did Dr. Schulzberg leave the laboratory?

A. It must be in 1891—between 1891 and 1892—1891, I guess.

9 Q. Before Dr. Schulzberg left the laboratory, had you, for yourself, made copies of phonographic records?

A. Before he left I made some independently of his work.

10 Q. Please describe the process which you carried out in the making of those copies.

A. I helped make the masters, or we got them from the man who had charge of taking the original records on wax cylinders, and then we put them in a vacuum chamber, a glass globe which was exhausted afterwards, and anodes of different metals; we used plati-



num and silver and gold to deposit a film of metal on the outside of the master or original record; and after that we connected that to an electrical conductor or wire that we attached to the ends of the original as plated and put them in a copper solution, solution of sulphate of copper, and applied electric current to make a deposit on the plated master. After that we took that master out again; first we boiled it out, and afterward, to save the master, we shrank it by cold out of the copper shell which was thus obtained, so that the copper shell was the mold then that carried the record on the inside. After the matrix was made and duly trimmed up on both ends, we took a blank cylinder of the same wax, the same material, and shaved it down to a certain size, so that we could cool it and insert it into the mold; sometimes I made it within .002 of an inch (first I made them .002 of an inch larger than the mold is on the inside) and cooled it—put it in the ice-box and let it cool down, so that it would shrink small enough so as to allow it to go into the mold, the matrix. After that we clamped the whole matrix between two end rings to hold the blank and mold in place. After that we took a hollow core of brass and heated that with water, let hot water run through, and when it had a certain temperature I put the blanks in the mold right over the core and let the heat expand the cylinder—the blank, inside the mold. After that I reversed the whole thing—set it on a ring, and pressed the core down a little further, so as to give it more pressure sideways. After that we pushed the core out, and put the whole thing into the ice-box again—the mold and the blank inside and all—and waited a little while until the duplicate was small enough to withdraw it easily by a longitudinal movement.

11 Q. When did you first carry out such a process as you have above elaborately described?

A. That was in 1889; the winter from 1888 to 1889.

12 Q. Can you produce the matrix in which you first carried out this process?

A. This is the matrix that I used without end rings when I first tried the process. I know it by the brass shell around it, because I had to strengthen it to withstand the pressure.

The matrix referred to is introduced in evidence and marked "Edison Exhibit First Wurth Mold."

13 Q. I understand from your evidence that in the winter of 1888 or 1889 you made copies from the matrix just introduced in evidence by introducing a wax-like material therein in the form of a cylinder, and expanding it by heat and pressure into engagement with the metallic record surface of the matrix, after which the duplicate so secured was removed by direct longitudinal movement. Is that correct?

A. Yes, sir.

Question and answer objected to as leading.

14 Q. How thick were the duplicates that you made at that time?

A. We preserved the same size of core and the same outside diameter. Thickness of an ordinary phonograph record, with the exception that the surface inside was smooth, of course, for pressing and ordinary records have corrugations inside.

15 Q. Were copies such as you made of sufficient thickness to maintain their shape during and after the act of disengagement from the matrix, as distinguished from one which was collapsed?



A. After taking them out of the molds they were perfectly rigid.

Same objection.

16 Q. Did you make any other molds or matrices in the year 1889?

A. Well, I made a lot of them; I made a whole series from A to X—twenty-three or twenty-four—from 1888 to 1889.

17 Q. Did you make duplicate copies in those matrices?

A. I made them occasionally, but I didn't preserve any.

18 Q. And by what process did you make these copies from the matrices?

A. By the process I described—by expanding.

19 Q. And were these other matrices that you made in 1889 made by the same process as that you described?

A. The same.

20 Q. Did you do anything with the process in 1890?

A. Yes, I carried on experimenting all the time, trying to improve the plating, gold plating and the copper plating, and then after we had the molds pretty perfect we started on pressing again, pressing duplicates.

21 Q. Can you produce one of the molds which you made in 1890?

A. Yes, sir; I produce a mold which I think I made in 1890, but not later than 1891, by the same process.

The matrix referred to is introduced in evidence and marked "Edison Exhibit Wurth Mold of 1890."

22 Q. Did you make copies from this matrix last referred to?

A. I made some.

Q. 23. By what process?

A. By the same process, pressing hot and inserting

the blank, and heating and expanding and cooling afterward.

24 Q. What kind of duplicates were made?

A. On the same ordinary phonographic waxlike material of the usual thickness.

25 Q. Did you make any other matrices in 1890?

A. From the winter of 1890 to 1891 I made a second series, as stated, numbered 1 to 87, and some lettered ones.

26 Q. Did you make duplicate copies in each of these matrices?

A. Not in each of them; many of them I didn't finish.

27 Q. Can you give any estimate of the number of duplicates that you made in the year 1890?

A. I made just a few; I can't tell how many—just a few to try the molds.

28 Q. Can you produce any of the duplicate copies made by you from any of the matrices made in 1890?

A. I produce a duplicate copy made in 1894 from one of the 1890 molds.

The duplicate copy referred to by the witness is introduced in evidence and marked "Edison Exhibit Wurth Duplicate from 1890 Mold."

29 Q. Can you produce a matrix made in 1891 with which you carried out the process in controversy?

A. I produce a matrix made in 1891, numbered 75, and containing a phonographic record called "The Song that Breaks My Heart."

The matrix referred to by the witness is introduced in evidence and marked "Edison Exhibit Wurth Mold of 1891."

30 Q. How was this matrix made?

A. It was made the same way as all the others.



31 Q. How were duplicate copies made from it?

A. In the same way as I have already described.

32 Q. Can you produce a duplicate record made in 1891?

A. This is one of them.

The record referred to by the witness is introduced in evidence and marked "Edison Exhibit Duplicate from 1891 Mold."

33 Q. With reference to "Edison Exhibit Wurth Duplicate from 1890 Mold," is this the only duplicate you made from that mold?

A. No, I made over a thousand of them, of which this is one.

34 Q. You spoke, in describing the process, of the employment of end rings for holding the wax-like blank in place in the matrix. Can you produce a matrix equipped with the rings referred to?

A. This is the first one.

35 Q. When was this made?

A. That was made in the spring of 1889 by the same process. Some copies were made, but were not satisfactory.

The apparatus referred to is introduced in evidence and marked "Edison Exhibit Complete Mold of 1889."

36 Q. When you used the several matrices to which you have above referred, did you make use of clamping rings, such as are shown in this exhibit?

A. Not in the very first one to which I have referred, but in all the others.

37 Q. Did you continue to make matrices and secure copies therefrom from 1891 onwards or not?

A. I kept busy on it most all the time, trying to improve the plating and improve the pressing.

38 Q. Was the process as carried out by you from 1891 onwards the same as that which you have described or different?

A. It was practically the same.

39 Q. To what extent were there variations in the process?

A. May be in pressing, heating more or less or pressing more or less, or changing the sizes of the blanks, making them a few thousandths more or less, or the time—the time for pressing was the most delicate; that took long experimenting to obtain the best results. But in all the processes which I carried out the matrix was made as I have described, and the copies were obtained therefrom by expanding under the presence of heat, as explained.

40 Q. Without going elaborately into further details, Mr. Wurth, can you produce matrices or molds made by you, for example, in the years 1893, 1896 and 1897?

A. Yes; I produce matrices made in the years mentioned by the same process, and from which duplicates were made as I have already explained.

The three different matrices referred to by the witness are introduced in evidence and marked respectively "Edison Exhibit Wurth Mold of 1893," "Edison Exhibit Wurth Mold of 1896" and "Edison Exhibit Wurth Mold of 1897."

41 Q. With reference to "Edison Exhibit Wurth Mold of 1896," I notice that it is very much larger than the others. Please tell me generally what the history of this mold is?

A. Mr. Edison had made a machine, which he called



his "400-thread machine," for receiving a blank  $2\frac{3}{4}$  inches in diameter and 6 inches long, with 400 threads per linear inch, his purpose being to make a machine which would take a very long record. He believed that by making a machine having a record of this relatively great size and fineness of thread a sufficiently long record could be made to make the phonograph a more valuable instrument, and he stated to me that if duplicates could be accurately obtained from such an original record the process would be much more valuable. This machine was made in 1895 or 1896, and I carried out the process with masters made thereon, the matrix being made and copies obtained therefrom as I have described; but, owing to the fineness of the thread and the great length of the record, the operations were very delicate ones, and the practical carrying out of the process involved a great deal of careful experiment. Much of my time from 1893 to 1896 was spent in carrying out Mr. Edison's suggestions for making recorders by means of which more perfect masters could be secured and reproducers for effecting a more perfect reproduction from the duplicates.

42 Q. About how many duplicate copies did you make from this big matrix?

A. Twelve or fourteen.

43 Q. Are you still carrying out the process?

A. Yes, sir; still working on it.

44 Q. Can you produce a mold made in 1900, for instance?

A. Yes, I produce a matrix made in 1900 by me by the same process, and from which duplicates were made by expansion under heat, as I have already described.

The matrix referred to is introduced in evidence, and marked "Edison Exhibit Wurth Mold of 1900."

45 Q. How perfect was the process in 1890, for example; how perfect were the duplicates that you got?

A. At that time we used the ear tubes only and not the horn, and the duplicates were loud enough for ear tubes, but not for horns. The quality was very good. Duplicates from "No. 75" are as good as those which are made now, though not quite as loud.

By "No. 75" the witness has reference to "Edison Exhibit Wurth Mold of 1891."

46 Q. Along what lines did your experiments run in the commercial development of the process?

A. During all these years I was seeking to improve the quality and loudness of the duplicates, and to this end directed my attention to the making of the original masters, so that they would be more perfect, and to the perfection of the details of the process, by means of which there would be less likelihood of failure, since, owing to the very delicate operations, they have to be carried out under uniform temperatures and with great care. As I have already said, much of my time was also spent in experimental work with recorders, by which the quality of the masters would be improved, and also in work on reproducers for more loudly reproducing from the duplicates. This work occupied most of my time from 1889, when I started in on it, up to the present time.

47 Q. Having reference to the records made, for example, in 1897, what were they used for; do you know what they are used for?

A. They are used as masters to make machine duplicates from.

48 Q. So that, in 1897, as I understand it, you considered the resulting duplicates to be substantially perfect; is that correct?

A. Yes, sir; it was considered good.



49 Q. During the time that you were working on this matter, how often did you see Mr. Edison about it?

A. When he was here, I saw him at least every week, once or twice.

50 Q. Did he assist you at all?

A. Well, he gave suggestions, especially about the recorders, and about making the molds generally, too.

51 Q. Can you give me any idea, Mr. Wurth, how many matrices were made by you under this process from 1889, when you started in on the work, up to March, 1889, or up to the first of 1898?

A. About three hundred matrices, all by the same process.

52 Q. Can you tell me about how many duplicate copies were made altogether during the same period?

A. About six or seven thousand, perhaps eight thousand, all by the same process. All of the duplicates were made of the usual phonographic wax-like material and were of the usual thickness.

53 Q. In withdrawing all the copies, were they shrunk and withdrawn longitudinally or not?

A. Withdrawn longitudinally, yes, sir, without being collapsed.

*Cross-Examination by Mr. Sheridan.*

54 X-Q. What became of all of the remainder of that thousand phonograms or duplicates which you said were made in 1890?

A. I saved about a half a dozen of them and the others were destroyed again; melted them up.

55 X-Q. Have any of those phonograms been sold?

A. No, sir.

56 X-Q. Have you sold any of the phonograms up to the present date?

A. Of our duplicates, you mean?

57 X-Q. Of your duplicates.

A. No, sir.

58 X-Q. Are you still experimenting on the making of these duplicates and matrices?

A. Yes, sir.

59 X-Q. You made an affidavit in this application, did you not, Mr. Wurth?

A. I think I did.

60 X-Q. The affidavit I refer to was executed by you somewhere around August 29, 1898. Do you recollect it?

A. I recollect it, yes, sir.

61 X-Q. Did that affidavit refer to experiments made by you while you were in the employ of Mr. Edison in regard to this process?

A. I think it did.

62 X-Q. In speaking of the Edison process in this affidavit, you said that you usually heat the blank after it has been inserted in the mold to a temperature of 115° Fahrenheit, and that this heating does not in any way affect the brittleness of the blank, nor does it make it plastic. Was that true?

A. Yes, sir; that is true.

63 X-Q. Again you stated in that affidavit that you found it impracticable to heat a blank to the plastic point after its introduction into the mold. Was that true?

A. I think it is.

64 X-Q. Did you ever make a celluloid copy by that process?

A. I did lately, last winter.



65 X-Q. But you didn't make any celluloid records prior to 1898?

A. No, sir.

66 X-Q. Did you, or did you not, soften any of these phonograms in making them, preliminary?

A. Not preliminary; they were not softened except to heat them so much that they would take the impression after they were introduced into the mold.

67 X-Q. Now, in that affidavit, when comparing it with the process described in the Young patent, which was a reference, you said that the heating of the duplicate in the Edison process was for the purpose of expanding the blank into engagement with the record, and not in any way to affect the brittleness of the blank. Was that true with your experiments?

A. Yes, sir; that is true.

68 X-Q. Then there was no softening other than there was by the slight raising of temperature from the normal temperature to about 110 or 115 degrees?

A. That is all.

69 X-Q. Now, as regards the making the matrix, the deposit *in vacuo* of a metallic film upon the original master was done for the purpose of getting and forming the indentation of the matrix?

A. Yes, sir; getting the conducting metallic surface on the master.

70 X-Q. Now, the electro-plating on that was to form a backing and support for that electro-vacuous deposit?

A. No, it is not exactly like that. The plating in vacuum is to give the master record a metallic conducting surface, so that the copper will deposit on there, because the wax itself is non-conducting; it wouldn't deposit on the bare wax.

71 X-Q. Now, let me make this clear. The deposit of a metal in the vacuum when the matrix is formed still forms the inner surface of the matrix and is a part of it. Is that true or not?

A. Yes, it is true.

72 X-Q. And that thin film of metal always stays as a part of the matrix?

A. It unites with the matrix.

73 X-Q. Did you ever try to make a record by coating the original wax master with plumbago?

A. Yes, sir.

74 X-Q. But you abandoned that for the electro deposit *in vacuo*?

A. I found it made a poorer duplicate.

75 X-Q. And when you made that duplicate in that way by the use of plumbago the plumbago did not unite to form a portion of the matrix?

A. No, sir; it left the copper bare.

76 X-Q. And you didn't consider that a practicable process?

A. No, I did not; I didn't consider it good, because the copper deposits in a rougher state than it does in the gold, and the cylinders are rougher and more scratchy—not satisfactory.

77 X-Q. Between 1888 and 1889 you didn't consider this process at all as applicable to celluloid, did you?

A. No, I did never think of making celluloid duplicates.

78 X-Q. Now, with your knowledge of the art, do you think, or did you think, it was possible to take a strip of celluloid, or a cylinder of celluloid, and place it within the mold or matrix and expand it by heat alone to get an impression thereon?



A. Never possible. It takes a pretty strong pressure to make an impression on the celluloid.

79 X-Q. Then the celluloid records which you did make you made after seeing or being told of Mr. Lambert's patent, did you not?

A. No, sir; I made experiments with celluloid before I heard of Mr. Lambert's patent.

80 X-Q. That was in 1899, was it not?

A. I started on it in November or December, 1899.

81 X-Q. When were you first informed of the Lambert patent that is in this interference?

A. Last summer—some time about May or June.

82 X-Q. In making a celluloid phonogram did you soften the celluloid phonogram before you placed it in the mold?

A. No, sir.

83 X-Q. Was it made by the process the same as the issue of this interference?

A. I made it the same way as I made the wax duplicates.

84 X-Q. Did you depend on pressure entirely to force it into the indentations.

A. Pressure and heating, of course.

85 X-Q. About what degree of temperature did you heat it to?

A. It must have been over 200.

*Re-Direct Examination by Mr. Dyer.*

86 Re-d. Q. You said, in answer to Mr. Sheridan's questions, that you were experimenting with the process at the present time. Did you mean to convey the impression that the process was still in an experimental condition?

171 Question objected to as leading.

A. Oh, no.

87 Re-d. Q. As I understand your examination-in-chief, you said that in 1897 copies were made by the process which were perfect enough to be used as masters in a mechanical duplicating process; is that correct?

Same objection.

A. Yes, sir, that is all right. What I mean by experimenting any longer is to make the process more perfect and to reduce the expense of carrying it out.

88 Re-d. Q. When you subject the blanks to heat, Mr. Wurth, does the surface become plastic enough to receive an impression? A. If you heat it enough, yes. It will receive an impression practically cold, but so slight that it is useless. You have to heat it to a certain degree to make the wax soft enough to take the impression perfectly.

89 Re-d. Q. If you should heat a phonograph blank made of the usual wax-like material to the same temperature that it is heated in carrying out the process, which, I understand, is between 115 and 120 degrees Fahrenheit, and should drop it on the floor, would it break? A. It would break.

90 Re-d. Q. So that it would still be brittle? A. Yes.  
Signature waived by consent.



296 *Complainant's Rebuttal Evidence.*

120 UNITED STATES CIRCUIT COURT  
Northern District of Illinois  
Northern Division.

National Ponograph Company, Complainant,	} In Equity No. 26598 on Patent No. 713,209.
vs.	
Lambert Company, Defendant.	

To Thomas Francis Sheridan,  
Solicitor for Defendant,  
Marquette Building,  
Chicago, Ill.

Please take notice that the complainant herein will take the testimony of Frank L. Dyer, of Montclair, N. J., and Albert Wurth, of Orange, N. J., and others, each of whom resides more than 100 miles from the place of trial herein, and more than 100 from any place at which the Circuit Court of the United States for the Northern District of Illinois, Northern Division is appointed to be held by law at final hearing for use in behalf of the complainant before John F. Randolph, Esq., a Notary Public in and for the State of New Jersey, who is not of counsel, nor interested in this cause, or other proper officer, at the Edison Laboratory, Valley Road, West Orange, N. J., on Tuesday, the 3rd day of May, 1904, at 10.30 o'clock, A. M., and thereafter from day to day as the taking of the depositions may be adjourned and such testimony to be so taken in accordance with the provisions of Sections 863, 864, and 865,

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of the Revised Statutes of the United States, and in  
accordance with the rules of this Court.

DYRENFORTH, DYRENFORTH & LEE  
Solicitors for Complainant.

Dated April 28th, 1904.

Service of the foregoing notice is hereby acknowl- 482  
edged this day of April, 1904.

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Solicitor for Defendant.

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No. 26598  
No. 713,209.

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UNITED STATES CIRCUIT COURT,  
NORTHERN DISTRICT OF ILLINOIS, NORTHERN DIVISION.

NATIONAL PHONOGRAPH COMPANY,

vs.

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LAMBERT COMPANY.

In Equity.  
No. 26,598 on  
Patent No. 713,209.

Rebuttal testimony on behalf of complainant taken pursuant to notice before John F. Randolph, Esq., a Notary Public and Special Examiner by consent, at the Edison Laboratory, West Orange, New Jersey, May 3, 1904.

487 Present.—RICHARD N. DYER, Esq., for Complainant.

**Frank L. Dyer.**

FRANK L. DYER, being duly sworn, testifies as follows :

DIRECT EXAMINATION :

12 Q. You have already given a deposition for complainant in this case ?

A. I have.

488 13. Q. Have you read the deposition of defendant's expert, Henry W. Carter ?

A. I have.

14. Q. What in your opinion is the relation of the invention of the patent in suit to the present art of duplicating phonograph records by means of molds carrying the record in relief on their bore ?

A. The patent in suit stands at the foundation of the modern art of duplicating phonograph records. That art not only found its inception in Mr. Edison, but it was developed and first

actually used commercially by him. In one of his earliest British patents relating to the phonograph, No. 1644 of April 24, 1878, he suggests the possibility of securing duplicate copies of an original phonograph record by three distinct methods: *first*, by a mechanical transference, wherein a reproducer engaging with the original record is connected with a recorder which forms a copy on an adjacent blank; *second*, by a knurling operation, wherein a knurl corresponding to the original sound record impresses its formation on a rotating blank or moving strip; and *third*, by a casting process, wherein a plastic material like plaster of Paris is cast in a split mold having the record formed in negative on its bore. In his first United States patent on the phonograph, No. 200521 dated February 19, 1878, he had previously referred to this possibility as follows:

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"The record, if it be upon tinfoil, may be stereotyped by means of the plaster of Paris process, and from the stereotype multiple copies may be made expeditiously and cheaply by casting or by pressing tinfoil or other material upon it. This is valuable when musical compositions are required upon numerous machines."

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When Mr. Edison took up the work of commercially perfecting the phonograph in 1887, the possibility of making duplicate copies of phonograph records evidently again presented itself to his attention. At this time the records were no longer in the form of a metal foil temporarily applied to the threaded mandrel, but were cylindrical tablets having a coating of a waxlike composition in which the record was cut by means of a cutting recording tool connected directly with the diaphragm. In his early work in thus commercially perfecting the phonograph, some time appears to have been devoted to the development of the original blank or recording surface, and the present modern all-wax blank

COURT,

HERN DIVISION.

In Equity.  
No. 26,598 on  
Patent No. 713,209.

Complainant taken  
andolph, Esq., a  
by consent, at  
New Jersey,

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with a tapered bore was invented and patented by him (Nos. 382418 and 382462 dated May 8, 1888). About this time the modern standard dimensions of blank and pitch of thread were adopted by Mr. Edison, and for the past 15 years all standard talking machine records have been approximately  $2\frac{1}{8}$  inches in external diameter,  $4\frac{1}{2}$  inches in length, and with a pitch of feed screw of 100 per inch, giving a corresponding pitch to the record groove. These standards are now abso-

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lutely fixed, since several million talking machines are now in use in this country, and many million phonograph records for use therewith are manufactured annually. With the original Edison phonograph of 1878 the pitch of the record groove was about 20 threads per inch, so that the available surface in which the record could be formed was  $\frac{1}{30}$  of an inch. The adaption of the present modern standards by Mr. Edison resulted in a contraction of the available space in which the record groove could be formed to .01 of

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an inch or only  $\frac{1}{3}$  the width of that available with the original tinfoil machine. Of course this necessarily made the problem of successfully duplicating phonograph records enormously more difficult. The difficulty of the problem which Mr. Edison encountered in 1887 will be appreciated when it will be remembered that the surface of the phonograph record which he sought to duplicate was composed of millions of distinct but excessively minute indentations, the *maximum* width of which was only .01 of an inch, and each of which was of a characteristic form which had to be faithfully copied in order to secure an accurate reproduction of the sounds.

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In order that a successful duplicating process could be carried on, it was first necessary to construct a matrix or mold carrying an accurate negative representation of the original record, and on January 5, 1888 Mr. Edison filed an application for a patent which issued on October 18, 1892, No. 484582, in which patent he fully describes several schemes for making matrices or molds, including the



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escribes several  
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so-called vacuous deposit process now utilized by com-  
plainant, as well as the graphite process which defend-  
ant employs. At this early date in the art, although  
Mr. Edison had apparently fully perfected the process  
for making an exact matrix or mold, he had not per-  
fected the process by which duplicate phonograph  
records could be obtained from such a matrix or mold,  
and in the patent referred to he describes the expedi-  
ent of splitting the matrix or mold longitudinally so  
as to form a sectional mold in which duplicates could  
be cast as in an ordinary casting operation and from  
which the resulting articles could be removed by open-  
ing the mold sections after the molded material had  
set. It is evident from a consideration of the claims  
of this split mold patent (the application for which  
was filed on January 5, 1888) that it was taken out  
primarily to cover the special process followed in  
making a matrix or mold by vacuous deposit, because  
the claims are all limited to this feature. That patent  
did not cover a commercially operative process of ob-  
taining the duplicates from the matrix or mold, for the  
reason that the expedient of splitting the mold would  
result in the production of minute bars or fins on the  
duplicates which would seriously interfere with the re-  
production, and also because the casting process sug-  
gested therein would inevitably result in an imperfect  
surface marred with air bubbles, since at the in-  
stant the molten material engaged the mold surface  
it would be in a condition of agitation and aeration.  
It is evident now that a split mold could not  
be successfully used from which to obtain  
duplicate phonograph records, but up to January 1888  
Mr. Edison had not made the discovery that a dupli-  
cate record could be removed from a continuous mold  
without injury to the recording surface. In fact, the  
discovery could not have been made, since the char-  
acter of the records of that date was such that they  
could not be satisfactorily removed from a continuous  
mold. In other words, in January 1888 phonograph  
records were made by means of a chisel-like recording

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tool forming a flat bottomed record groove of the same width throughout but of varying depth and with substantially vertical walls. Consequently in casting a record of this kind in a mold, it was necessary that the record should be gotten out before contraction had taken place, because any relative longitudinal movement of the record with respect to the mold would result in injury to the surface. Of course by using a split mold, the record could be removed by opening the mold sections immediately after the material had set and before any longitudinal contraction had taken place.

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Recognizing, apparently, the difficulties attendant upon the use of a split mold, and especially the condition of agitation and æration of the material at the moment of setting, and the danger of injury to the record by a longitudinal contraction before the mold was opened to release the duplicate, Mr. Edison appears to have turned to the possibility of duplicating records

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by a knurling process, as he had generally suggested in his British patent of 1878 before referred to. Therefore on March 8, 1888 he filed an application for a patent on a knurling process which issued on May 8, 1888, No. 382419, and in which the British patent is specifically mentioned. This knurling suggestion does not differ materially from the suggestion of the British patent except as to the refinement of the details by which a very perfect knurling surface is secured. By a knurling operation an impression would be formed in

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a perfectly quiescent material and no considerations of longitudinal contraction would be encountered, so that the special variety of records in vogue at that date could no doubt be duplicated. But the knurling process described was open to one of the objections of the split mold process, because in producing the knurl the latter required to be divided, and hence the surface of the duplicates would be characterized by the formation of at least one longitudinal bur or fin corresponding with the joint. Although the knurling patent suggested a way by which some of the objections to a split mold



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process might be overcome, it still did not represent the perfected process or one which in my opinion could be carried out commercially.

Of course during this very active period Mr. Edison was not devoting himself exclusively to perfecting the process for duplicating phonograph records, because many applications for patents were filed relating to other branches of the art as well as to other arts and for which numerous patents were granted. One of the improvements made by Mr. Edison in the summer of 1888 related to the records themselves, as he had found that records made by a chisel-like recorder and having substantially flat bottoms were very difficult to reproduce satisfactorily, since if the reproducer became tilted to any extent, it would not engage the record across its width, and the resulting reproductions would be affected and great and uneven wear of the record would take place. In order therefore that a record might be obtained in connection with which the reproducer would automatically centre itself so as to always properly track the record, the suggestion was made by Mr. Edison of forming the record by means of a curved edge recorder, so that the record at all points would present in cross-section a portion of a circle and would vary in width and depth, and to engage with such a record he also suggested a reproducer in the form of a small sphere. These suggestions are found in Edison's patent No. 430278 of June 17, 1890 (the application for which was filed April 10, 1889). All modern talking machine records of the phonograph type are now, and since the fall of 1888 have been, produced by means of curved edge cutting tools, the diameter of the recorder being about .035 of an inch or  $3\frac{1}{2}$  times the maximum width of the record groove. Consequently the greatest depth to which such a recorder can cut is necessarily very slight, being in practice somewhat less than .001 of an inch or perhaps less than a sheet of ordinary tissue paper. The phonographic waves thus cut in the recording surface by the curved edge recorder are several

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million in number for each record, and vary in width from .01 of an inch to practically nothing, and in depth from less than .001 of an inch to practically nothing. Under the microscope these waves appear as more or less connected gouges of extremely complex form but all characterized by being excessively shallow since obviously the depth of each must necessarily bear a definite relation to its width. The waves of the maximum width are considerably less than .1 as deep, while as the width decreases, the relative depth is very much less, so that it is probable that some of these excessively minute waves are 25 or more times wider than they are deep. These records are referred to in the patent in suit as being characterized by a "shallowness of the phonographic record grooves" (page 2 lines 63-64). The provision of record grooves of this enormously complex character wherein the waves varied both in width and in depth instead of varying only in depth as with the previous records, apparently presented still further difficulties towards the solution of the problem of accurately duplicating them.

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In the fall of 1888 the discovery was made by Mr. Edison which enabled him to achieve the long-sought-for object and obtain an absolutely exact copy of the record surface notwithstanding its complexity and excessive minuteness. That discovery consisted in the observation that by forming a record in a continuous mold or matrix, as for example by expanding a blank therein, the resulting duplicate could be contracted diametrically to a sufficient extent to clear the engaging surfaces and permit the duplicate to be withdrawn without injury to the record surface taking place by reason of the longitudinal contraction which necessarily accompanies the diametric shrinkage. This discovery became possible, in my opinion, because of the fact that the extreme shallowness of the waves and the absence of any engaging vertical surfaces due to the curved cross-section of the waves themselves resulted, when any diametric contraction had taken



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place, in a comparatively great longitudinal clearance, so that the first effect of the contraction was to provide ample room for a longitudinal shrinkage without any injury to the surface. Thus it became possible to effect a sufficient diametric contraction as to completely clear the engaging surfaces and permit the duplicate to be withdrawn without encountering any difficulties due to longitudinal contraction, as would be likely to be the case with records having practically vertical walls. The announcement 514 of this discovery is found in a caveat filed by Mr. Edison on October 26, 1888, and which was a part of the record in the Edison-Lambert interference referred to in my previous deposition, in the following words:

"For reproducing records, or rather duplicating the same, I coat the surface of the cylinder with, say, silver by an electro-vacuum process, then plate the outside  $\frac{1}{8}$  inch thick with copper, put the cylinder on a mandrel, true the outside 515 by grinding to a taper, fit this in a taper steel die, then dissolve wax or other material out, and then put in a blank cylinder of plastic (when hot) material, force in a plunger, spread the same against the record, and then allow the same to cool. *It will contract sufficient away from the record to allow of its being taken out.*"

After having made this discovery by which the problem was finally solved, Mr. Edison carried on an 516 elaborate series of experiments for the purpose of refining and improving the details of the operations until at the date of the application for the patent in suit the process was in a complete and practical condition, and shortly afterwards duplicate records produced by that process were used commercially in large numbers. During this experimental period of nearly 10 years the phonograph business had developed to such an enormous extent that it was no longer possible to commercially manufacture and sell *original records*



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at a sufficiently attractive price to the public. To meet the demand the so-called mechanical duplicating process was developed and extensively used, wherein a reproducer engaging with an original record was connected with and operated a recorder engaging a blank so as to produce a transference of the sound waves from one to the other, as suggested in Edison's original English patent. This mechanical process was ineffective and the results secured were of poor quality,

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but notwithstanding its defects it continued to occupy the field until the commercial advent of duplicate records constructed in accordance with the process of the patent in suit, and at the present time all duplicate records now made are constructed in accordance with this process and utilize Mr. Edison's discovery which made the process possible.

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Having considered the steps which led up to the invention of the process of the patent in suit, and replying directly to your question, I am of the opinion that the patent in suit stands at the foundation of the modern art of duplicating phonograph records by means of matrices or molds. It is the pioneer patent in this art. I have already analyzed the terms of the patent in suit by my previous deposition, so that I need only refer to it very generally here. The invention which it covers is of a two-fold nature, the first part relating to the steps followed in forming the duplicate, and the second part relating to the steps followed in removing the duplicate from a continuous mold however the forming process may be carried out.

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The special forming process which Mr. Edison describes consists in expanding a blank by heat into engagement with the matrix surface and then applying mechanical pressure to effect a more intimate engagement and sharpen the impression, but the patent points out that "the entire expansion may be effected mechanically" (page 2 lines 54-55), and it is also clear that the entire expansion might be effected by heat alone. Two of the claims, the first and the last, are limited specifically to processes in which an im-



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pression is secured by relying on the expansive force of the blank, effected by heating the same for example, but other claims (*i. e.*, the 4th, 5th, 9th, 10th and 17th) define the forming operation by language broad enough to include the expansion of a blank in any way, whether by mechanical expansion or by the application of heat or both. So far as the second part of the invention is concerned, the operations which are followed in removing the duplicate are set forth in the second and third claims in connection with language ("forming a hollow cylindrical plastic phonogram within said mold") broad enough to include either a pressing or a casting operation. As a matter of fact, the second and third claims were suggested to Edison by the Patent Office Examiner during the prosecution of his application, for the purpose of securing an interference with an application of Joyce which specifically described a casting operation. The invention set forth in the second and third claims relating to the removal of the duplicates by diametric contraction sufficient to entirely clear the surfaces is utilized in connection with all modern processes for duplicating phonograph records by means of matrices or molds, while the invention defined by the 4th, 5th, 9th, 10th and 17th claims is utilized in all modern processes for duplicating such records wherein a blank is expanded into engagement with a matrix as distinguished from processes wherein molten material is cast in a mold.

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Adjourned at the request of defendant's counsel to May 17, 1904, at 11 A. M. 524

WEST ORANGE, N. J., May 17, 1904.

Met pursuant to adjournment.

Present, RICHARD N. DYER, Esq., for Complainant.

(DIRECT-EXAMINATION OF FRANK L. DYER CONTINUED.)

15 Q. Please explain more fully the facts leading to the making of claims 2 and 3 of the patent in suit as



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shown by the Patent Office prosecution, and the bearing which those facts have upon the interpretation of said claims?

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A. The interference between the application for the patent in suit and the Lambert patent No. 645920 of March 20, 1900, referred to in my previous deposition, was finally decided in Edison's favor by the Assistant Commissioner of Patents on December 10, 1901. This interference had been pending ever since May 16, 1900, but it had been delayed somewhat by the attempt by Lambert to have it dissolved on the ground that the Edison and Lambert processes did not interfere, but this contention was not accepted by the Examiner and the Commissioner, both of whom decided that while the Edison and Lambert processes might differ in small details, yet both involved the same patentable invention. On January 31, 1902 the Examiner in charge of the Edison application suspended further action for two weeks in view of additional interference proceedings, and on March 8, 1902 he suggested that Edison should introduce in the application a number of additional claims including the following;

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"The method of producing hollow cylindrical phonograms, which consists in obtaining a mold having a reverse phonogram record on the inner wall of a cylindrical opening, forming a hollow cylindrical plastic phonogram within said mold, releasing the phonogram from the mold by a difference in temperature between the mold and phonogram sufficient to entirely clear the surfaces, and removing the phonogram from the mold by direct longitudinal movement."

This claim, it will be noted, was identical with the patented third claim, except that with the latter the radial contraction is defined as "releasing the phonogram from the mold by a reduction in temperature sufficient to entirely clear the surfaces", By amend-

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casting process and in the other case to an application in which a pressing operation was described. The two applications being in this condition, the interference was declared, involving as its issue the second and third claims of the Edison patent, and that interference was decided in Edison's favor.

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From this it appears that the second and third claims of the patent in suit were granted by the Patent Office and accepted by Mr. Edison as covering a broad generic invention, not limited to any special method of expanding a blank, or in fact to any expanding operation, since the claims were considered to be sufficiently comprehensive to actually include a process in which a blank was not utilized but wherein the material was introduced into the mold in a liquid condition.

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16 Q. Please explain your understanding of the meaning of the expression "of sufficient thickness to maintain its shape during and after its engagement with the matrix" found in claim 4 of the patent in suit, and similar expressions found in claims 9, 10 and 17, and also the expression "of sufficient thickness to maintain its form under normal conditions" appearing in claim 5 of the patent in suit?

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The expressions in question are used in the claims for the purpose of distinguishing a process wherein the material is thick enough to receive a surface impression of the record and at the same time present a sufficient body to support the record surface and permit reproductions therefrom, from processes in which very thin material is used adapted by heat to be made pliable, so that the record shall extend substantially through the entire wall, which therefore requires an independent support or backing. In other words, the expressions distinguish from a process in which the body of the material is not distorted, from a process in which the body of the material is distorted. A process of the latter type is disclosed in the British patent to J. Lewis Young No. 1478 of January 23, 1894. This Young patent was

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cited as a reference against the application for the first Lambert patent, No. 645920 of March 20, 1900, and in that application the essential distinction between the two types of processes was made by Lambert. By amendment filed in the Lambert case on November 22, 1899 the following addition to the specification was inserted :

" In carrying out my process, it is an absolute requirement that the blank phonograms or tubes 538 must be of a thickness to receive and retain in a perfect form the indentations of the matrix and *at the same time have within itself a sufficient backing or support for the reproduction of the record phonographically after the formation of the record on its face and the removal of the tube from the matrix.* It is practically impossible to use very thin walled tubes or hollow cylinders for my process, because the phonographic reproduction or sound from such thin records, 539 supposing the tubes to be capable of even temporarily maintaining or holding their shape, would be weak, distorted, indistinct and imperfect, but *as a matter of fact the records themselves made of thin material are not capable of retaining their shape and would be impractical in actual use.* By using a relatively thick walled tube or hollow cylinder, the objections which would occur in practice with a very thin tube are entirely overcome and the produced records are 540 a merchantable article."

In the same amendment Mr. Lambert in further distinguishing between the two types of processes—one using relatively thick material and the other using very thin material—submitted this argument :

" In the Young patent a very thin hollow cylinder is required which is collapsed inwardly in order to be removed from the matrix ; while



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in applicant's invention the blank cylinder is, and of necessity must be, sufficiently thick to receive and retain its impressions without being collapsed and without danger of warping or distorting the record, also furnishing sufficient form or backing for the phonographic reproduction of the record.

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"The use of a very thin substance as required in the Young patent is impracticable for several reasons. It will not receive perfect indentations, especially if they are well pronounced; it will not retain its cylindrical shape unless properly backed, which is mechanically impossible; and even if such a thin record can be made, it is impossible to back and support it so as to avoid variations in its elasticity because of imperfect contact with the backing, and these variations producing corresponding imperfections in the record will impair or destroy its usefulness.

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*Applicant has repeatedly attempted to produce records in accordance with the Young patent, but has never been able to produce a record in any sense practical or operative."*

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The amendment and arguments above quoted were introduced by Lambert in connection with claims in which the two types of processes were distinguished by the expression "a relatively thick cylinder or tube". On the same day (November 22, 1899) Lambert presented a second amendment in which a further refinement was made, the expression then reading "sufficiently thick to maintain its shape after disengagement from the matrix". On January 18, 1900 the Examiner suggested a claim to Lambert in which the expression as it now appears in the Edison claims was used, namely, "sufficiently thick to maintain its shape during and after the act of disengagement from the matrix." These expressions were all based on the distinction to which Lambert had referred by his amendment and argument above quoted. This distinction also appears

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from the testimony of Mr. Lambert in the Edison-Lambert interference, from which I quote (answer to x-Q. 9):

"Up to that time—1897—I always had trouble in mounting the records and hearing them, due to their thin wall; but the first work upon cylinders sufficiently thick to *maintain their shape for any definite period after removal from the matrix* was done in 1897."

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After the Patent Office Examiner was convinced by Mr. Lambert of the force of the distinction between the two types of processes, a claim corresponding to the first claim of Lambert's patent No. 645920 was suggested in the Edison case on January 18, 1900, and was presented by Edison in an amendment on the following day but which for some reason was not received by the Examiner. The Lambert patent therefore issued, and on April 17, 1900 the claim was again presented by Edison and became the issue of the Edison-Lambert interference. Manifestly the same distinction between the Lambert process and that suggested by the Young patent exists between the Edison process and that of the Young patent, since in carrying the Edison process into effect, the blank is of sufficient thickness to receive and retain the impression and at the same time present enough body to support the record surface and do away with the necessity of using an independent backing. Thus with the present Edison records the thickness of the wall is, roughly speaking, .180 of an inch, so that the very deepest records are somewhat less than  $\frac{1}{180}$  of the thickness of the wall. I understand that with the present Lambert records the walls are from .040 to .050 of an inch, so that the very deepest impressions are from  $\frac{1}{40}$  to  $\frac{1}{50}$  the thickness of the walls. In other words, with the Lambert records the thickness of the body of material which supports the record surface is at least 40 times as

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great as the very deepest impressions which are formed in that surface.

17 Q. Mr. Carter, in answer to Q. 6 of his deposition says :

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" The Edison patent in suit sets forth one of the processes which has been proposed for this purpose—although a crude one of doubtful practicability, and one which has never been reduced to a commercial basis, as I understand it, or, if so, to but a very limited extent, having been abandoned even by the patentees in favor of more satisfactory methods covered by other patents."

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And in answer to Q. 39 Mr. Carter refers to Edison's patent No. 667662 issued February 5, 1901, as describing the process actually employed commercially by Mr. Edison in the manufacture of duplicate records. Do you agree with the statements of Mr. Carter contained in the matter quoted ?

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A. No, sir. I should hardly call a process crude if by carrying it into effect it is possible to make exact copies of such an excessively complex article as a phonograph record. Nor is there any doubt as to the practicability of the process described in the patent in suit, because that exact process is a perfectly practicable one by which thousands of duplicate records have been made. Furthermore, the patented process, even to the specific details described, was followed on a considerable commercial basis by Mr. Edison at about the time of the filing of the application for the patent. Finally, the patented process has not been abandoned in favor of more satisfactory methods, because so far as the second and third claims are concerned, the methods which they cover have been followed by Mr. Edison ever since the commercial introduction of the process in 1898, and at the present time many thousand records are made daily by this method. It is true that at the present time Mr. Edison is using a casting

process such as is referred to in his patent No. 667662, since the special material which Mr. Edison prefers to use is particularly adapted for a casting operation. Since defendants continue to use celluloid (one of the materials referred to by Mr. Edison in the patent in suit), which cannot be manipulated by a casting operation, the defendant therefore continues to use the particular process of expanding a blank, which the patent in suit sets forth. Undoubtedly if Mr. Edison should at any time make use of a material which could not be satisfactorily cast, he would again adopt the special process of expanding a blank in a mold as suggested in the patent in suit.

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18 Q. In answer to Q. 7 Mr. Carter states that the only object of heating the blank in the Edison process of the patent in suit is to cause the blank to force itself into intimate contact with the bore of the matrix so as to take the impression of the latter by its own expansive force, and he asserts that this is shown by the prosecution of the Edison application in the Patent Office. Do you agree with Mr. Carter in this matter?

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A. While it is a fact that in the patent in suit Mr. Edison states that the impression can be secured merely by heating the blank so that the engagement with the matrix will be secured by reason of the expansive force of the blank itself, this special suggestion is made the subject of only the first and last claims. The patent distinctly states that with

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"blanks made of sufficiently viscous material the entire expansion may be effected mechanically by forcing a tapering mandrel within the same." (Page 2 lines 53-56)

It is perfectly evident that with the materials referred to by Mr. Edison, the application of heat would tend to make the blanks more or less soft and viscous, and some of the claims (5th and 6th) refer to the step of "softening said blank by heat". The decision of the Examiners-in-Chief in the Edison-Lambert inter-



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ference deals also with this point and quotes from the testimony of Mr. Edison and of his assistant Charles Wurth showing that the application of the heat did in fact soften the material, as of course it must. Furthermore, in Mr. Edison's very earliest disclosure of the patented process found in his caveat of October 26, 1888 he refers to the use of "a blank cylinder of plastic (when hot) material". The arguments made by Mr. Edison's attorneys during

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the prosecution of the application for the patent in suit and to which Mr. Carter refers, were designed to distinguish the special kind of a pressing operation suggested by Mr. Edison from the operations of the Lioret and Young patents in which the blank was distorted during the operation of taking the impression. But this distinction was not accepted by the Patent Office Examiner, who in fact adopted Mr. Lambert's distinction so far as the Young patent is concerned, and who in order to distinguish from the Lioret patent

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suggested the limitation that the resulting duplicate could be removed by a direct longitudinal movement. The particular argument to which Mr. Carter refers was made in connection with the claims which were not limited to the employment of comparatively thick blanks nor to the removal of the duplicates by a direct longitudinal movement. The argument did not exclude the softening of the blank by heat, since that is an inevitable result, but was intended by Mr. Edison's attorneys to emphasize a possible difference in another function performed by the heat with the Edison process over that performed by the heat with the Young and Lioret processes.

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19 Q. Have you any criticism to make of the statements made by Mr. Carter in answer to Qs. 8 and 9?

A. In these answers Mr. Carter assumes that the patent in suit must be limited to a process in which the application of heat results in a sufficient expansion of the blank as to take an impression from the matrix. That this is an erroneous assumption is clear from the statement in the patent referred to in my last answer

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that with sufficiently viscous material, the *entire expansion* may be effected mechanically. Obviously the material may be made viscous or soft by heat or by the application of a solvent.

20 Q. In answer to Q. 10 Mr. Carter makes the statement that the original application for the Edison patent in suit affords no support whatever for the statement that the blank is softened by heat. Do you agree with him in this matter?

A. It is a fact that the original specification did not state in so many words that the application of heat resulted in softening the material, but with the materials mentioned by Mr. Edison (asphalt, stearic acid, stearate of soda, waxes, resins, ebonite, hard rubber, celluloid, and glue) the application of heat must necessarily result in softening the material to an extent of course dependent upon the degree of heat and the character of the material. On precisely the same statements in the specification as finally presented, the 5th and 6th claims were based, in which reference was specifically made to softening by heat, and these claims were accepted by the Patent Office without objection and as warranted by the disclosure of the specification. This point was fully considered in the Patent Office, since when the Lambert interference was declared the attempt was made by Lambert to have the interference dissolved for the reason, among others, that with the Edison process the blank was not softened by heat, and in support of this motion the attempt was made to effectively rely on the same argument made by Mr. Edison's attorneys that Mr. Carter now refers to. The motion in question was first considered by the Principal Examiner, who in his opinion of August 22, 1900, in denying the motion, said:

"Lambert's next contention is that Edison's specification does not disclose the use of a cylinder of softened material, but, on the contrary constantly refers to his material as hard."



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After showing the fallacy of this contention and referring particularly to Edison's suggested use of celluloid, the Examiner said :

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"It is a well known property of celluloid that at very low temperatures it is comparatively hard and more or less brittle, and that as the temperature is increased, it gradually softens, reaching a state of plasticity somewhere below the boiling point of water. While, therefore, Edison may not heat his celluloid blank sufficiently to render it plastic, yet the heating would inevitably soften it more or less from the very nature of the material employed."

An appeal was taken by Lambert to the Commissioner of Patents, who on November 15, 1900 affirmed the Examiner's decision, the Commissioner saying :

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"I agree with him that when the specifications are examined, the conclusion that naturally follows is, that the language warrants the deduction that both parties originally disclosed the same patentable method."

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This decision of the Commissioner of Patents was under the practice final on the motion to dissolve, but after testimony had been taken the point was still raised and was passed upon by the three tribunals who had occasion to consider the merits of the controversy. In considering the question, the Examiner of Interferences, in his decision of May 28, 1901, said :

"Counsel for Lambert has also contended that there is no interference in fact between the applications of the parties for the reason that Edison employed the process in the production of wax cylinders which he heated to about 115 degrees Fahrenheit, primarily to expand them into engagement with the interior surface of the

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matrix, which heating, as counsel for Lambert contends, does not soften the material of which the cylinders are composed. Edison contends that such heating does soften the cylinders. There has been introduced into the record no showing or proofs that the wax cylinders when heated to 115 degrees are not softened as contemplated in the issue of this interference. The Examiner is unable to find, either from the argument of counsel or from the experts in this Office, any ground upon which to hold that Edison did not soften his material when it was heated to the temperature alleged." 570

The Examiners-in-Chief, in a lengthy opinion of August 13, 1901, also considered the point and said:

"The wax record is hot. Being hot, it must have been somewhat softened. After it was softened by the heat, the plunger within the matrix and blank effected the expanding pressure within the blank." 571

And again:

"The evidence is that the blanks are softened in this process. There is no real contradiction between the averments of Wurth in his affidavit made during the prosecution of the application and his testimony in this proceeding. There is a difference of opinion between him and Edison as to what constitutes plasticity. Both agree that the wax cylinder is softened for the same purpose. It is also in evidence that celluloid records were made by this process without softening the blank before it is put into the matrix; that they cannot be made by heat alone, but can be made by heat and pressure, the pressure being greater than that needed for wax cylinders." 572



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Finally, the Assistant Commissioner of Patents, who had occasion to decide the case on appeal, also considered the point, and in his opinion of December 10, 1901 he said :

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" Counsel for Lambert also contends that the material used by Lambert is softened previously to its being placed in the matrix mold, and that such is not the case with Edison. The essential thing is that this material, if too hard to receive the matrix impression, may be sufficiently softened to receive the same. Of course this softening must occur before the material is made to take against the matrix. It is clear that this is done in both cases. In Edison, heat is applied. It is true that Edison does not explicitly state that the material is 'previously softened'. He does state, however, that heat is applied. Now this description is sufficiently clear to anyone skilled in the art to understand that materials such as used are softened by this application of heat. The law only requires that the description should be sufficiently clear that it may be understood by anyone skilled in the art. With this requirement Edison has fully complied."

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21 Q. In answer to Q. 11 Mr. Carter expresses the opinion that the British patents to Lioret and Young disclose

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" the complete process of the patent in suit except possibly as this process can be regarded as limited to the impressing of a plastic record against a suitable matrix by its own expansive force."

Please first consider the Lioret patent and explain what bearing, if any, it has upon the invention of the patent in suit?

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A. The Lioret patent was cited in the Edison application and was fully known to the Examiner. It was also cited in the Lambert application, but arguments were presented to the Examiner which satisfied him that the Lioret patent was not a pertinent reference to the process here involved. Furthermore, distinctions were brought out in the claims of the patent in suit at the suggestion of the Examiner that fully distinguished the claims from this reference.

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The Lioret process differs from the Edison process in the essential respect that whereas Edison forms his original record on the ordinary cylindrical phonograph blank, Lioret formed his original record on the top of a relatively high and sharp spiral thread. This difference in the character of original masters used makes the Lioret process entirely different from the Edison process, and, assuming the Lioret process to be operative, results in the production of an entirely different kind of duplicate record from that secured by the Edison process.

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Since with the Lioret process the original record is formed on the top of a relatively high and sharp spiral thread, a mold obtained therefrom will present the record on the bottom of a corresponding channel, so that in order to take an impression from such a mold, the impressionable material requires to be forced into and intimately engage the very bottom of the channel or groove. Assuming that an impression could be secured in this way, it will be evident that in order to remove the resulting duplicate, the latter would have to be unscrewed from the mold, and this is described in Lioret's corresponding United States patent No. 528273 (page 2 line 111) which is also in evidence. Of course the expedient of unscrewing a duplicate phonograph record from the mold would be entirely impracticable in the modern art, since the duplicate would have to be revolved more than 400 times to clear it, and it would be impossible to prevent the obliteration of the record in this operation. Not only does Lioret's disclosure differ from Edison's invention

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in the respects that the character of the master is different, the mold is different, and the particular manipulations followed in securing the impression and removing the duplicates are different, but the two methods necessarily result in the production of different articles. A duplicate sound record obtained by the Lioret patent will necessarily have the record formed on the top of a spiral thread, and such a record could not be used in connection with any standard talking machines at

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present on the market or which were on the market, so far as I know, at the date of Lioret's patents. On the contrary, by following the Edison method, a duplicate record is obtained which resembles in all respects the original records secured before his invention and which were designed to be used and are used to the extent of thousands daily in connection with standard talking machines now on the market. With the Lioret process, owing to the character of mold used, it is mechanically impossible to perform the characteristic operations of

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the Edison process, namely, contracting the duplicate diametrically to an extent sufficient to entirely clear the surfaces, thereby permitting the duplicate to be removed by a direct longitudinal movement. On the contrary, with the Lioret process the surfaces of the phonogram and matrix or mold are not cleared, and the phonogram or duplicate is removed by unscrewing it as distinguished from a direct movement. This essential distinction between the Lioret process and a process of the Edison type not only appears on

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the face of the patents themselves, but was suggested by the Patent Office Examiner as patentably distinguishing it, and moreover this suggestion was first made to Lambert and was then made to Edison. On January 18, 1900, the Examiner in the Lambert case stated that the first claim as then presented "is somewhat awkwardly worded and the process is probably incomplete, and should also better distinguish from the patent to Lioret". He therefore suggested a claim which for the first time contained the limitation to the removal of



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the duplicate "by direct longitudinal movement". This suggested claim was made in the Lambert case on January 22, 1900. It was also suggested to Edison on January 18, 1900, and was presented by amendment of April 17, 1900 in the Edison application.

22 Q. Does the Lioret patent, in your opinion, describe an operative and practicable process for securing duplicate phonograph records—giving your reasons for your views.

A. It does not. I have attempted experimentally to carry on the operations described by Lioret in his United States and British patents, but without success. I first had a regular standard phonograph changed with a feed screw of about 20 threads per inch and had a recorder mounted therein provided with a stylus held rigidly against lateral movements, so that it would accurately track the top of a sharp thread. I also had a number of soft steel blanks made as suggested by Lioret, cut with the proper thread, having the proportions illustrated in the Lioret patents and a pitch of 20 threads per inch, and on top of this thread a phonograph record was formed. The steel master thus obtained was then hardened and put in a plating bath so as to receive a deposit of copper. In order that the bath might not affect the steel, a cyanide solution was used. Lioret in his United States patent says :

"I remove this tube from the matrix cylinder by first heating it externally to expand it sufficiently to enable it to be unscrewed from the said cylinder, the impression being so slight that very little expansion is necessary." (Page 2 line 92 *et seq.*)

I found it absolutely impossible to separate the copper deposit from the steel master as Lioret suggests, even when the copper shell was heated with a gas flame, wet rags were applied to the steel master and the latter was clamped in a heavy vise and the copper deposit engaged by a powerful Stilson wrench. The shell would not separate from the master, but the two were as intimately engaged, as if welded together.



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I present the master with the copper deposit thereon, from which it will be seen that the two are considerably scarred in the effort to separate them.

Offered in evidence and marked "Complainant's Exhibit Lioret No. 1."

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The attempt was then made to coat a second steel master with graphite in the hope that a slightly yielding film would be formed between the master and the deposit to permit the deposit to be removed. For this purpose the steel master was coated with a solution of beeswax and benzol, so that when the benzol evaporated, a thin film of beeswax would be left on the master, but not sufficiently thick to fill up the record. This wax film was then evenly rubbed with graphite to give a conducting coating, and the master thus prepared was put in the cyanide bath. It was immediately found that the cyanide solution appeared to dissolve the wax so that the graphite floated to the surface. This was therefore impracticable. I then turned my attention to plating the steel master in an acid solution, although this would be naturally very objectionable since the acid would attack the steel and injure the record surface. The master was therefore again coated with beeswax and treated with graphite and then plated with copper in an acid bath, but it subsequently developed that the wax film was too thin to resist the acid, which attacked the steel and practically ruined the record surface. It would have been impossible to use a thicker film of wax without completely filling up the record. I found it possible, although very difficult, to remove the copper deposit obtained in the acid bath by the use of a Stilson wrench with the application of heat to the copper deposit and of cold to the master, but the master was very badly attacked by the acid, and in removing the mold the record surface was completely destroyed by reason of the efforts exerted in unscrewing it. These experiments which I have so far described convince me that

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it is a mechanical impossibility to make a mold as Lioret suggests in his patents without completely destroying the record surface.

I then attempted to make a mold which should correspond with that described by Lioret by employing a wax master, and for this purpose had several wax masters prepared, formed with the same spiral thread on their surfaces. One of these masters was recorded upon in the machine described, the record being formed on the top of the thread as suggested by Lioret, and the master thus obtained was first coated with gold and then plated with copper. The copper deposit was then backed up with a brass ring so as to form a complete mold. It was found that the master could not be removed by shrinking and unscrewing it, as might be supposed, since the longitudinal contraction firmly engaged the threads of the master and mold and prevented a separation of the two. Consequently it was necessary to break out the master. I present the mold in question and also a fragment of the master from which it was made.

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Offered in evidence and marked "Complainant's Exhibit Lioret No. 2" and "Complainant's Exhibit Lioret No. 3".

Having obtained an apparently satisfactory mold in this way, I then attempted to make duplicates therefrom, and for this purpose I had a number of celluloid blanks turned down to the right size, formed with tapering bores, and also had a tapering core made so as to expand them. I present one of these blanks and also the core with which I experimented.

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Offered in evidence and marked "Complainant's Exhibit Lioret No. 4" and "Complainant's Exhibit Lioret No. 5."

One of these blanks was then inserted in the mold, the core was introduced in the blank, and the whole



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was immersed in very hot water until the blank became plastic, after which the core was driven in by a heavy screw press while the parts were still submerged. In this way the celluloid was displaced so as to enter the spiral channel formed in the mold and presumably to engage with the record formed at the bottom of that channel. After these operations, as described in Lioret's United States patent, the latter continues:

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"I then plunge the whole into cold water and the celluloid recovers its hardness and is at the same time generally contracted sufficiently to permit the easy withdrawal of the ring *c* from the mold *a'* by unscrewing it therefrom."

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I found it absolutely impossible to perform this operation even when the mold and duplicate therein were put on ice and a great contraction secured. The difficulty resided in the fact that the *longitudinal shrinkage* of the duplicate caused the threads to jam tightly together and prevent the duplicate from being removed. The duplicate was absolutely wedged into the mold, and I was able to remove it only by forming two keyways on its bore, engaging a brass key with such ways, putting the key in a vise, and unscrewing the mold by a Stillson wrench. This operation was very tedious and probably required half an hour's hard work. The duplicate obtained in this way is very badly disfigured, a part of the thread being stripped off, at one point a part of the mold was actually carried away by the record, and the record surface is of course worthless. I present this duplicate herewith, from which its useless character can be observed.

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Offered in evidence and marked "Complainant's Exhibit Lioret No. 6".

The experiments which I have thus described satisfy me that the process set out in the Lioret patents is inoperative for two reasons: FIRST, a mold cannot be

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made as Lioret suggests without a practical obliteration of the record surface. SECOND, even if a mold could be made, the duplicates could not be removed therefrom without material, if not total, injury to the record surface. Furthermore, with the Lioret process there is nothing to prevent water from entering the space between the blank and mold, which would prevent an intimate engagement with the record surface on account of the inevitable entrapping of water bubbles.

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Adjourned to May 18, 1904, same time and place.

WEST ORANGE, N. J., May 18, 1904.

Met pursuant to adjournment.

DIRECT EXAMINATION OF FRANK L. DYER CONTINUED :

23 Q. Now please consider the Young British patent and state what bearing, if any, it has upon the patent in suit? 603

A. The Young patent, like the Lioret patents, was also before the Examiner during the prosecution of the Edison application as well as of the original Lambert application, and the claims were allowed with that reference directly in mind. In describing his process, Young obtains a mold in the manner suggested by Mr. Edison in his 1892 patent, namely, by coating an original master record with graphite, electroplating thereon, backing up the electroplate, and removing the original master. Having secured a mold in this way, Young expected to obtain duplicates therefrom by introducing within the mold a "very thin hollow cylinder" of material capable of being collapsed, buckled or folded inwardly, such as celluloid, xylonite or vulcanite. The patent states that this tube is "of the same size externally as that of the original wax cylinder upon which the record was first taken" and consequently such a tube would be *slightly larger* than the 604



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bore of the mold. The mold is now "warmed or slightly heated by any convenient means" and the very thin collapsible blank is then inserted within the mold, this being no doubt possible by reason of the slight expansion of the mold in being heated, but being certainly possible by first collapsing the blank and then introducing it within the mold. The blank is then "rendered *pliable* by a gentle heat (which may be that given off by the heated electro and its casing)" and is then pressed "gently and evenly up to and against the face of the electro" so as to take an impression. The Young patent is entirely silent as to any suggestion of means by which this pressure is secured, nor does it point out whether the pressure is obtained simultaneously on all parts of the blank or progressively on different portions thereof. Having thus obtained an impression on the very thin collapsible blank, the operations followed in removing it are thus described:

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"When the said plastic cylinder has cooled, I am enabled, *by slightly collapsing this inwardly*, to cleanly and easily remove it from the electro."

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Of course, dealing with a very thin collapsible blank, and *particularly with a blank which normally is slightly larger than the bore of the mold*, these operations are necessary. After the duplicate has been thus secured, it is returned to its tubular form as accurately as may be possible, and is then mounted on a cylindrical base of the same character as the original record, thereby forming a *composite article* capable of use on standard talking machines. Aside from the fact that the description of the Young patent is very meager and obscure, the Young process is fully distinguished from the Edison process in the following respects:

*First*, with the Edison process the blank employed is relatively thick, so that the impression is.

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formed on the surface thereof while the bulk of the material acts as a support for the record and permits effective reproduction from the duplicate. With the Young process a very thin blank is employed, which is made *pliable*, so that the blank as a whole follows the sinuosities and undulations of the record surface, and consequently reproduction cannot be secured without subsequently supporting the duplicate on a proper backing. In other words, with the Edison process the blank used is sufficiently thick to maintain its shape during and after the act of engagement with the matrix, whereas with the Young process the blank in the act of being forced against the matrix surface is distorted and changed to accord with the variations of the record surface.

*Second*, with the Edison process the duplicate, after it has been formed, is contracted diametrically so as to clear the engaging surfaces and thereby permit the duplicate to be removed without changing its cylindrical shape. With the Young process the very thin duplicate is removed by collapsing or bending it inwardly, which necessarily requires that the duplicate shall be returned to its original shape before it can be used. In other words, with the Edison process the duplicate is removed by first changing its size or diameter without changing its shape; whereas with the Young process the duplicate is removed by changing its shape without changing its size or diameter.

*Third*, by the Edison process a duplicate record is secured as a single homogeneous article having an impressed record surface and an integral body or support therefor which may be made many times the thickness of the very deepest impressions. With the Young process a composite record is obtained, in which the record surface



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is separate from the body or support. Since it would be impossible to secure an absolutely accurate fit between the thin celluloid shell of the Young process and the backing therefor, the record surface would be more or less fugitive, and under the weight of the reproducer stylus would tend to be smoothed or ironed out. Furthermore, with the Young process the support is described as being of a different material from the record surface, so that under variations of temperature the materials would shrink or expand unevenly, and if the support should expand to a greater extent than the record surface, this would also tend to obliterate the record surface.

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For these reasons I do not regard the Young patent as disclosing or anticipating the material features of the invention of the patent in suit. These differences between a successful duplicating process and that suggested by Young were recognized by Mr. Lambert, against whose original application the Young patent was cited. For instance, in an amendment filed in the Lambert case on October 16, 1899 it was said:

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"We submit that this English patent does not show an operative process for producing the record of applicant, or a satisfactory record—one that will meet the requirements of commerce—and that, being inoperative or a mere paper reference, it cannot stand in the way of applicant."

And again in amendment filed October 22, 1899 the matter which I have previously quoted was added to the Lambert specification, pointing out as

"an absolute requirement that the blank phonograms or tubes must be of a thickness to

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receive and retain in a perfect form the indentations of the matrix and *at the same time have within itself a sufficient backing or support for the reproduction of the record phonographically after the formation of the record on its face and the removal of the tube from the matrix.*"

24 Q. Do you regard the Young patent as describing a practically operative process for the manufacture of phonographic duplicate records—giving your reasons for any views you may express. 618

A. No, I do not regard any process as being practically operative that involves a sufficient collapsing of its walls to permit it to be removed from a matrix and a necessary restoration to its original form, because these operations would be liable to injure the delicate surface. Neither do I regard a process as practically operative that necessitates the mounting of a very thin shell on a support or backing, because in that case the record would be weak, uncertain, more or less fugitive, and become gradually obliterated. This fact is recognized in the original Lambert patent, which states : 619

"It is practically impossible to use very thin walled tubes or hollow cylinders for my process, because the phonographic reproduction of sound from such thin records, supposing the tubes to be capable of even temporarily maintaining or holding their shape, would be weak, distorted, indistinct, and imperfect; but as a matter of fact the records themselves made of thin material are not capable of retaining their shape and would be impractical in actual use." 620

And as was stated in the argument in the Lambert case filed November 22, 1899 :

"Applicant (Lambert) has repeatedly attempted to produce records in accordance with



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the Young patent, but has never been able to produce a record in any sense practical or operative."

25 Q. Did Mr. Lambert, in his testimony in the interference case, furnish any support for your opinion as to the operativeness of the Lioret and Young processes?

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A. I am further confirmed in my opinion that the processes described in the Lioret and Young patents are inoperative by the testimony of Mr. Lambert in the Lambert-Edison interference. In Mr. Lambert's rebuttal testimony in that interference I find the following questions and answers:

"x-Q. 17. Does the Young patent describe a process for making celluloid records?

"A. I do not consider it to be operative."

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"x-Q. 20. Do you make the same answers with reference to the Lioret patent?

"A. Yes, with the exception—if one can use a comparative term—that it is even more inoperative than the process described in the Young patent."

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26 Q. In answer to Q. 12 Mr. Carter refers to arguments which were made in the prosecution of the Edison application to distinguish over the Lioret and Young patents. What bearing, if any, does this matter have, in your opinion, upon the issues of the present case?

A. None that I can see. The arguments which Mr. Carter quotes were presented by Mr. Edison's attorneys in connection with claims which were entirely different from the claims which are here involved, inasmuch as they were not limited to the use of material sufficiently thick to maintain its shape during and after engagement with the matrix, nor were they limited to the diametric shrinkage of the formed duplicate to an

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extent sufficient to clear the engaging surfaces, nor were they limited to the longitudinal withdrawal of the duplicate. The claims in support of which these arguments were presented related to the manner of taking the impression without regard to the character of the blanks, whether relatively thick or very thin, or to the way in which the duplicates were removed, whether by diametric shrinkage or by collapsing or by unscrewing. The distinction which Mr. Edison sought to make in this respect over the Lioret and Young patents was that with the references the material required to be *necessarily* heated to an extent which would permit the material to be displaced or distorted, whereas with the Edison method, since a mere surface impression was taken, it was not necessary to carry the heating to such an extent. On this point, however, the Patent Office did not accept the distinctions as presented in these arguments, although later the Examiner accepted the distinction proposed by Lambert over the Young patent, namely, that the blank should be sufficiently thick etc., and the Examiner himself suggested the distinction over the Lioret patent that the duplicates were withdrawn by a direct longitudinal movement. These latter distinctions are the ones which appear in the claims of both the Edison and Lambert patents, and the patent in suit was granted in view of these distinctions rather than in view of the distinctions which were urged in the arguments quoted by Mr. Carter.

27 Q. In answer to Q. 12 Mr. Carter suggests that the naming of celluloid in the Edison patent as one of the materials which might be employed was manifestly simply a blind attempt to extend the scope of his invention. Was celluloid an unknown material for receiving records in the phonograph art?

A. On the contrary, celluloid was a very well known material from which to make phonograph records at the date of the application for the patent in suit. Not only had it been suggested in the Lioret and Young

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patents, but as early as June 18, 1887 an application was filed by Herrington which issued February 12, 1889, No. 397856, in which celluloid is referred to as a suitable material from which to make a celluloid record, the record being made in the material after the latter had been first softened by the application of a solvent. In this patent Herrington suggests the use of ether for softening the celluloid. And in a later

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patent dated March 12, 1889, No. 399265, Herrington suggests the making of *duplicate* records of celluloid, the latter being softened by the application of heat at the time of receiving the impression. These Herrington patents not only show that long before the application for the patent in suit, celluloid had been suggested as a suitable material from which to make original or duplicate phonograph records, but also show that this material could be softened by heat or by the use of a solvent prior to receiving the impression, and therefore would be an obviously useful material with the Edison process of the patent in suit even if Edison had not mentioned it in the patent in suit.

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28 Q. In answer to Q. 13 Mr. Carter refers to an argument advanced in prosecuting the application for the patent in suit, *i. e.* that the heating of the blank in the Edison process does not soften the blank but operates solely to cause the blank to take the impression of the mold by its own expansive force—and says that while a soap record may be printed by its own expansive force, a celluloid record cannot be so printed. Has this distinction any bearing upon the invention of the Edison patent as covered by the claims here in issue?

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A. Not in my opinion. The distinction is embodied only in the 1st and 18th claims and is not embodied in the claims here in issue. I have called attention to the fact that the patent in suit states that the entire expansion may be secured mechanically when the material is sufficiently viscous, and it is evident that the application of heat would in fact tend to soften the celluloid so as to permit an im-



1887 an application issued February 12, is referred to as a celluloid material after the application. Herrington suggests the celluloid. And in a later application, 399265, Herrington records of celluloid, application of heat at the time. These Herrington records the application for the celluloid, which has been suggested as a material to make original or to show that this material or by the use of a material impression, and there-fore the material with the suit even if Edison is in suit.

Carter refers to an application for the making of the blank in the process of the blank but to take the impression by its expansive force—and may be printed by its record cannot be so bearing upon the covered by the claims

The distinction is emphasized in the claims and is not in issue. I have called the applicant in suit states that the celluloid is secured mechanically by the application of heat, and it is evident that heat would in fact be applied as to permit an im-

pression to be secured. This would be so even if Herrington had not suggested 10 years before the application for the patent in suit that celluloid could be softened sufficiently to take a phonographic impression by the application of heat or of a solvent. This same distinction was raised by Lambert in the Edison-Lambert interference, and, as I have already pointed out, all the tribunals of the Patent Office—the Primary Examiner, the Examiner of Interferences, the Examiners-in-Chief, the Assistant Commissioner, and the Commissioner in person—decided that Edison's invention was embodied in a process wherein heat was used to soften the blank, which was then expanded mechanically. 633

29 Q. In answer to Q. 13 Mr. Carter expresses the opinion that the process of making the mold described in the Lioret patent is operative, and he criticises the showing of inoperativeness of this feature of the Lioret process made during the prosecution of the Edison application. Do you agree with him in this matter? 634

A. No, sir, I do not. Mr. Carter's opinion seems to be based entirely upon a reading of the Lioret patent, while my opinion is based on elaborate and careful experiments. I state without any qualification that it is impossible to make a mold in the manner suggested by Lioret. Mr. Carter appears to suppose that by increasing the difference in temperature between the copper shell and the steel master, or by increasing the diameter of the master and shell, a sufficient separation can be secured to permit the mold to be screwed off, but he forgets that this increase in temperature will necessarily result in a corresponding longitudinal expansion of the mold relatively to the master to thereby lock the two even more firmly together. He also expresses the opinion that any tendency of the mold to adhere to the master can be overcome "by applying a suitable coating to the cylinder before electro-plating it," but my experiments showed the impossibility of doing this. He finally ex- 635 636



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presses the opinion that "it would obviously be possible to dissolve out the original steel record from the galvanoplastic mold by the use of appropriate acids." Nothing of this kind is suggested by Lioret and I do not know whether it would be practicable or not, but if it could be done it would be an excessively tedious operation, requiring weeks and possibly months to accomplish it.

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30 Q. Mr. Carter in answer to Q. 13, while apparently agreeing with the position that the presence of water between the blank and the mold in the Lioret process would interfere with the formation of a perfect imprint on the blank, suggests that this could be obviated by a simple expedient. What is your view on this matter?

A. On this point Mr. Carter says that

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"it would be a simple minded mechanic indeed to whom, if he found any difficulty of this kind, it would not instantly occur to temporarily seal the joint between the ends of the mold and the matrix, as by a suitable insoluble wax, so as to prevent the water from entering the device."

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Mr. Carter, however, forgets that in thus providing the seal for preventing the admission of water, he effectively prevents the expulsion of air, which would be just as objectionable as water, and becoming entrapped would prevent the material from intimately engaging the record surface of the matrix. This is a very important consideration in this art, as it is strictly necessary that the blank should be brought into absolute contact with the record surface. Mr. Philpot, testifying for defendant, refers to this very point, and explains the difficulties that were first met with in defendant's operation :

"The steam and water were continually getting behind the celluloid tube, and the waste and loss of material was very great." (Q. 6).

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And in speaking of the original Lambert process in this same answer, he criticises it

"because there was no means set forth in the Lambert process for permitting the air, steam and water that might be confined to the surface of the celluloid cylinder and the bore of the matrix to escape."

31 Q. In his answer to Q. 13 Mr. Carter also expresses the opinion that the criticisms of the Young patent made during the prosecution of the Edison application as involving a collapsing or buckling operation as distinguished from a diametric contraction, are unfounded and absurd. What is your view of this matter? 642

A. I regard Mr. Carter's opinion on this point as entirely unfounded and as having no support by any considerations in this case. Up to the time of Mr. Carter's deposition there had never been a question but that with the Young process the duplicate record was collapsed and was not contracted radially. The Young patent states that the duplicate is removed by "slightly collapsing" it. Edison, in the prosecution of the application for the patent in suit, called attention to this fact. In the application for the Lambert patent the applicant in his amendment of November 22, 1899 stated that with the Young process the duplicate "is collapsed inwardly in order to be removed from the matrix." This distinction was accepted by the Patent Office Examiner in the prosecution of the Edison and Lambert applications. The Primary Examiner, in his letter of July 27, 1898 in the Edison case, stated that with the Young process "the blank is collapsed in order to take it from the mold." Furthermore, in the Messer patent No. 705,772 of July 29, 1902, owned by the defendant and covering its present apparatus, the distinction between shrinking and collapsing is fully recognized in the statement that when the duplicate has "cooled and *shrunk*, it is 643 644

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very great." (Q. 6).



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easily removed *without collapsing*" (page 2, lines 38, 39). When the defendant was endeavoring to have the Court set aside the preliminary injunction granted in this case, it asserted that with its process the duplicates were in fact collapsed or bent inwardly to remove them from the mold. The purpose of this assertion was obviously to show that defendant was using the Young process as everybody understood it, wherein the records are collapsed, and not the Edison process, which the defendant was charged with infringing, wherein the records are contracted diametrically. Thus Mr. Philpot, in his deposition for complainant of July 1, 1903, was asked by defendant's counsel

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"x-Q. 54. I would ask you if in removing this cool cylinder you do not frequently, if not entirely, have to collapse or bend the tube slightly to force it out of the matrix?

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"A. That is part of the process."

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"x-Q. 59. I am talking about the step of the process which is described as 'the disengaging action'; does the thin cylindrical phonogram maintain its shape during the act of disengagement, or does it bend or collapse slightly inwardly during the act of disengagement; which of these steps is true?

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"A. It is collapsed slightly during the act of disengagement."

And again, in answer to questions by complainant's counsel, he said:

"R-Q. 62. As a matter of fact, it does contract sufficiently to disengage the outer surface of the celluloid tube from the wall of the matrix?

"A. It disengages sufficiently with a pressure and a slight collapsing to allow us to remove it from the matrix.

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"R-Q. 63. Didn't it disengage sufficiently in some or most cases, so that it could be pushed out of the matrix without collapsing?"

"A. We find in most of these cases that we do not have a full print on our record.

"R-Q. 64. With that qualification, you answer the last question in the affirmative?"

"A. We have to discard records that come out in the way described by Mr. Dyer" (complainant's counsel).

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Finally, when I visited defendant's factory and saw its operations on July 23, 1903, it was represented to me that in order to remove defendant's records, it was necessary to collapse them slightly, and although the attempt was made to do this, it was evident that this was a mere trick to make it appear that defendant was not infringing the Edison patent. It now appears to be admitted, both by Mr. Carter and by Mr. Philpot in a later deposition, that with defendant's process no collapsing or bending of the duplicate is necessary or is employed to enable it to be removed. I therefore regard Mr. Carter's opinion on this point as being expressed for no other purpose than that of expediency and to meet the exigency of defendant's case, but that opinion finds no support either in the Young patent or in any of the proceedings which have so far been had. As matter of fact the exactly contrary view has been maintained by everyone up to this time, including the parties hereto as well as the Patent Office.

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32 Q. Do Mr. Carter's experiments made to support his opinion that the Young records would inevitably shrink out of the mold warrant that conclusion?"

A. No sir, they do not. Mr. Carter describes no experiment which complies with the conditions set forth in the Young patent. In the first place, the Young patent states that the blank is "of the same size externally as that of the original wax cylinder upon which the record was first taken," and con-



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sequently somewhat larger than the bore of the matrix. With the alleged Young experiments performed by Mr. Carter the blank was somewhat smaller than the matrix, so that at normal temperatures it could be readily introduced within the same. In the next place, the Young patent states that the blanks used are "very thin," from which Mr. Lambert understood and I understand that the Young patent has reference to a filmlike blank, since it required to be supported on a

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separate backing with all the objections incident to that practice, and was capable of being made pliable by the "gentle heat" given off by the mold which had been merely "warmed or slightly heated," and in this pliable condition caused to partake throughout its thickness of the variations and sinuities of the record surface. I do not understand that the so-called Young records made by Mr. Carter were mounted on separate backings, but gather from his deposition that the records were stiff enough to have a

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flange turned at the ends, by which they would be supported on the mandrel of the phonograph so that the surface would be self-sustaining under the phonograph reproducer. If this was so, the so-called Young records were made of a material thicker than that contemplated by the Young patent. In the next place, the Young patent is quite silent as to the means employed for pressing the blank against the record surface, and in fact, as I have pointed out, the patent does not even state that the pressure should be exerted simultaneously over the entire surface. Mr. Lambert recognized the necessity for doing this, because in his first patent he states :

"It is to be understood that in applying pressure to the interior of the tube or cylinder for forcing the same outwardly and against the face of the matrix that such pressure must be simultaneously exerted over the entire surface of the tube or cylinder and in a uniform manner so as to simultaneously force the entire exterior sur-



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face against the interior face of the matrix, for if otherwise there would be great danger and liability of a flow of material and a consequent distortion therefrom, producing an imperfect record."

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Yet Mr. Carter, in following the instructions of the Young patent, made use of the perfected Lambert apparatus, wherein the pressure is applied in this desirable way and wherein steam is first used to soften the blank and compressed air under high pressure is then employed for securing the final pressure. I understand that this Lambert apparatus was developed in its present form only after a long series of experiments, and in fact Mr. Philpot states that at one time the defendant Company contemplated abandoning the enterprise as hopeless. In the next place, the records used by Young were so thin that the material could be made pliable by the "gentle heat" given off from the mold which had been merely "warmed or slightly heated". Yet in his experiments Mr. Carter admits that the celluloid was heated by steam at a pressure of 40 pounds having a temperature from 275 to 290 degrees Fahrenheit, as he states in his answer to question 31. I note that in answer to question 30 Mr. Carter expresses the opinion that the "gentle heat" referred to by Young would be somewhat less than 300 degrees Fahrenheit; and he finds support for this assumption only by comparing it "with the fierce heat of a flame or furnace, for example, which would be measured in many hundreds of degrees running into the thousands." It seems to me that a reference to the fact that a mold is "warmed or slightly heated" cannot contemplate such a relatively high temperature as 300 degrees Fahrenheit, and in fact I have myself made celluloid records from material very much thicker than that contemplated by Young, in which a dry heat of less than 200 degrees Fahrenheit was employed. With the very thin records described by Young the material would be made plia-



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ble at an even lower temperature, so that I see no reason why the expression "warmed or slightly heated" should not be given its ordinary meaning and refer to a temperature which could be readily borne by the hand. In the next place, in Mr. Carter's experiments the reduction in temperature to which the duplicate was subjected was very much more than that contemplated by Young, being in fact more than 200 degrees

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Fahrenheit, whereas with the Young process "dealing with a gentle heat" and with a "warmed or slightly heated" mold, the reduction in temperature which takes place in cooling the duplicate would probably be less than 100 degrees and might not be more than 50 degrees. In the next place, the Young patent states that the duplicates are removed by collapsing them, whereas with Mr. Carter's experiments, owing to the special conditions under which the experiments were conducted, the temperatures employed, the thickness

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of material used, and the relation in size between the blank and the mold, the duplicates were contracted diametrically and removed longitudinally. Finally, the Young patent points out that after the very thin cylinder has been removed from the matrix with the record impressed therein, it is mounted on a separate backing or support, the obvious objections to which are pointed out by Mr. Lambert in his first patent. Yet with the so-called Young records made by Mr. Carter I do not understand that this was done, but

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that instead of this expedient the records were provided with end flanges, as with defendant's records herein.

Adjourned to May 19, 1904, same time and place.

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WEST ORANGE, N. J., May 19, 1904.

Met pursuant to adjournment.

Present, RICHARD N. DYER, ESQ., for Complainant.

THOMAS F. SHERIDAN, ESQ., for Defendant.

DIRECT EXAMINATION OF FRANK L. DYER CONTINUED :

33 Q. Does Mr. Carter's experiment with "Defendant's Exhibit Young Record No. 4" referred to in his answer to Q. 15 add anything to the situation ? 666

A. No, sir. In making the exhibit in question Mr. Carter left off the end flanges and mounted the tube on the regular Lambert blank, both of which were then introduced into the matrix and subjected first to the effect of steam and then to compressed air. Of course nothing of this kind is even remotely suggested in the Young patent, and I do not see any material difference from this particular experiment and the ordinary manufacture of celluloid records as commercially carried on by the Lambert Company. What Mr. Carter did was to make a composite record in one operation, differing, however, from the composite record of the Young patent in the respect that the entire article was composed of the same material. The experiment made by Mr. Carter was substantially the process described and claimed in patent to Petit No. 689408 of December 24, 1901, wherein a very thin celluloid shell is first applied to the matrix and a celluloid backing is then united thereto under the effect of steam and compressed air. Mr. Carter's experiment manifestly cannot have been contemplated by Young, since the Patent Office issued this independent patent on substantially the process that was carried on by Mr. Carter. Manifestly the operations followed in making "Young Record No. 4" were even less suggestive of the Young process than the operations followed in making the other alleged Young exhibits. 667

34 Q. In answer to Q. 16 Mr. Carter expresses the 668

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opinion that under some conditions contemplated by the Lioret patents it would not be necessary to unscrew the duplicate in removing it from the mold. Do you agree with this view?

A. I do not agree with Mr. Carter in this respect. He calls attention to the statement in the United States patent that

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"the threads of the matrix are very fine in practice and are very much exaggerated in the drawing to facilitate the illustration ;"

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and assumes that by using threads about  $\frac{1}{84}$  of an inch in depth, a sufficient diametric contraction could be secured to fully clear the engaging surfaces. It is a sufficient reply to this contention to call attention to the statement in the United States patent—which is much more full and complete than the British patent—that the duplicate is unscrewed from the mold. While undoubtedly Lioret intended to use finer threads than those shown, for example, in figures 1, 2 and 3 of his U. S. patent, and possibly as fine as those shown in figure 10 of this patent, he apparently did not intend to use threads of a substantially different form from those illustrated, namely, of substantially equal depth and width. In fact, although the patent contains different views taken on varying scales, some showing the threads as being quite large and others as relatively fine, it is a significant fact that all the views show substantially the same form or shape, namely,

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threads having a relatively sharp thin edge. Such a thread is described in the patent as one having a "triangular cross-section of suitable fineness" (page 1 lines 65, 66) presenting a "slight thickness of metal" (line 74) with a "sharp edge" (lines 80, 81). If, therefore, a relatively sharp narrow thread is used, it is quite immaterial whether it be fine or coarse, since obviously the longitudinal contraction would have the same effect in one case as in the other and would result in injury, if not destruction, to the



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record surface, as I determined by my experiments. It will of course be understood that in carrying out the Lioret process the difficulties are greatly increased by reducing the size of the thread, since it is a very difficult matter to so adjust a recorder that it will travel on top of a fine thread.

35 Q. In answer to Q. 17 Mr. Carter expresses the opinion that the contention that the process of the patent in suit is distinguished from the Young patent in the respect that Edison uses a blank "sufficiently thick to maintain its shape during and after the act of disengagement from the matrix", can be accepted as offering a basis for such distinction only upon the theory—

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"that the Edison process contemplates, and is strictly limited to, the printing of the record lines upon the surface of the blank by the pressure of its own expansive force through heating."

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Do you agree with this view?

A. I do not, but I have previously called attention to the fact that Mr. Edison's suggestion of taking an impression by the expansive force of the blank is embodied only in the first and last claims, which, by the way, are not limited to the employment of a blank "sufficiently thick to maintain its shape during and after the act of disengagement from the matrix." As I have previously said, the patent in suit makes it perfectly clear that when the material is sufficiently viscous, the entire impression can be secured mechanically, and the grant of the claims by the Patent Office, as well as the proceedings connected with the Edison-Lambert interference, show beyond any question that Mr. Edison's invention contemplates a process in which a blank is softened by heat and is then expanded mechanically. The expression which you quote and which was introduced into the claims represents a distinction, or rather two distinctions, over

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the Young patent which were first observed by Mr. Lambert and by him called to the attention of the Patent Office. Those distinctions are:

678 FIRST. That with the Young process the duplicate is removed by collapsing it, while with the Edison process (and in this I include that practiced by defendant) the duplicate is contracted diametrically so as to be withdrawn by a direct longitudinal movement. In other words, the Edison blank is sufficiently thick to maintain its shape "during" the act of disengagement from the matrix.

679 SECOND. With the Young process the blanks are so thin that the records are "weak, distorted, indistinct and imperfect" (Lambert patent No. 645920), whereas with the Edison process the blanks are sufficiently thick "to receive and retain in a perfect form the indentations of the matrix and at the same time have within itself a sufficient backing or support for the reproduction of the record phonographically after the formation of the record on its face and the removal of the tube from the matrix" (same patent). It will be remembered that Mr. Lambert stated that he had "repeatedly attempted to produce records in accordance with the Young patent, but has never been able to produce a record in any sense practical or operative", and in the Edison-Lambert interference (page 20 x-Q. 9) he said that it was not until 1897 that he commenced his "first work upon cylinders sufficiently thick to maintain their shape for any definite period *after* removal from the matrix." In other words, with the Edison process the blanks are sufficiently thick to maintain their shape "after" the act of disengagement. Of course this second distinction between the Edison and Young processes resides in the fact that the effect on the blank is quite different in the two cases—with the Young process the very thin blank is made pliable so that in taking the impression its wall follows the undulations of the record in very much the same way as that shown in figure 3 of the Petit patent No. 689408 which I have before

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referred to, whereas with the Edison process a mere surface impression is taken which has no effect on the bulk of the material, which is therefore free to act as a support or backing without the necessity of employing a separate support. Apparently Mr. Carter places no significance whatever on the words "and after" which appear in the quotation, and he finds no distinction between the expression as thus considered by him and the operations described by Young only because in his experiments with the Young process he neither had 682 the conditions which Young sets forth, nor did he carry out the operations which Young describes.

36 Q. In answer to Q. 19 Mr. Carter, in explaining the object of the end flanges in defendant's celluloid record, states that one object is—

"to give the necessary rigidity and strength to the record, the cylindric wall of which is too thin to properly support itself except as thus strengthened."

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Do you think Mr. Carter is correct in this matter?

A. I do not think that he is correct in this respect, and to support my views I present a Lambert record No. 799 with the mark "Pat'd July 29, 1902" thereon, from which it will be seen that the wall presented is relatively stiff and rigid, so that no backing is necessary to support it, since the material offers of itself the necessary support for the record surface. As I have previously said, 684 the body of material presented in this record for supporting the record surface is from 40 to 50 times the depth of the very deepest impressions and is probably several hundred times the depth of many of the impressions. Such a tube with the end flanges cut off is not collapsible in the sense that that expression is used in this art. In fact, the Messer patent, whose date appears on this exhibit, states that the record "is easily removed without collapsing".



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Lambert record produced by the witness, and the end flanges cut therefrom, offered in evidence and marked "Complainant's Exhibit Lambert Record and Separated End Flanges".

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37 Q. In answer to Q. 23 Mr. Carter expresses the opinion that the feature of the Messer patent consisting in sealing the joint between the blank cylinder and the top and bottom plates by means of integral flanges turned in from the body of the blank itself "is really the keynote to a successful commercial process of producing celluloid records". Do you agree with this view of the importance of the Messer patent?

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A. The Lambert patent No. 742454 of October 27, 1903, to which Mr. Carter refers, describes the entire process as now carried out by defendant, but in that patent the blank is not provided with inturned ends. Celluloid blanks with inturned ends were, however, known long before the application for the Messer patent, being described in the patent to Petit No. 657956 of September 18, 1900, application filed November 15, 1899. In patent No. 689118 of December 17, 1901, also prior to the date of the application for the Messer patent, Petit describes a process for making celluloid duplicates by first subjecting the blank to the effect of steam and then to the effect of compressed air, as with defendant's process, and in figure 2 of this patent Petit illustrates the carrying on of his process in connection with a blank having inturned flanges, the

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presence of which would tend to improve the character of the seal, as with the Messer patent. For these reasons I regard the Messer patent as disclosing but very little advance, if any, over the art as well understood at the date of its application, and at best as relating to a small detail in the process which is quite independent of any considerations in this case. The company owning the Petit patents in England is making and selling celluloid records under those patents in large quantities without using the specific details suggested by Mr. Messer, so that I should hardly regard this



Messer patent as disclosing "the keynote to a successful commercial process".

By MR. SHERIDAN: That part of the witness's answer relating to what is being done under the Petit patent in England is objected to as voluntary and as hearsay, there being no foundation in the record for the statement.

38 Q. In answer to Q. 24 Mr. Carter expresses the opinion, supported by some alleged experiments, that it is not practicable to make a duplicate phonographic record of wax or waxlike soap, such as complainant's Edison records are made of, by using the machines and following the process employed by defendant in the manufacture of its celluloid records. Is Mr. Carter right in this matter, and do his alleged experiments support his conclusion? 690

A. I regard Mr. Carter's experiments as neither fair nor conclusive. As I understand him, he placed an ordinary Edison soap blank in a Lambert mold, turned on steam, presumably at a pressure of about 40 pounds, and found that the blank became immediately disintegrated. I have not verified Mr. Carter's experiment in this respect, but I accept his statements as correct, since these Edison soap blanks are slightly soluble in very hot water and would undoubtedly be seriously affected by steam at a high pressure and temperature. It does not follow that because steam does not affect celluloid except to soften it, the same effect would take place in connection with all materials, and I think that no one familiar with this art would attempt Mr. Carter's experiment with any hope of getting a successful result. It would immediately occur to a person familiar with the art that since with the Lambert process the object of using the steam is to soften the celluloid, when other materials are to be employed some equivalent means should be used for heating the material in a proper way. I have 691 692



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therefore carried on experiments with what I think may be fairly considered the Lambert process wherein soap blanks are employed but in which the softening of the material was secured by heating the mold, after which the material was mechanically expanded by means of compressed air under a pressure of about 120 pounds per square inch. The mold was heated by a water-jacket to a temperature of about 140 degrees Fahrenheit. In all respects the apparatus used was that shown in the Lambert patent No. 742454 except that no provision was made for admitting steam to the interior of the blank, and a rubber gasket was used to make a tight joint at the top. I present two records made by me on April 5, 1904 under this process. These experiments convince me of the entire practicability of expanding a soap blank by means of compressed air. One of these records has just been tried on a phonograph in the presence of defendant's counsel, and is an excellent and entirely commercial article.

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Records produced offered in evidence and marked "Complainant's Exhibit Lambert Process Soap Record No. 1 and No. 2".

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39 Q. In answer to Qs. 25 and 26 Mr. Carter expresses the opinion that it is not possible to produce defendant's celluloid records by the process described in the Edison patent in suit, and he refers to some alleged experiments in support of this opinion. Do you agree with his conclusion and do you approve of his experiments?

A. Mr. Carter, in my opinion, is not right, and I regard his experiments as entirely inconclusive. What Mr. Carter attempted to do was to introduce a Lambert blank in a mold, after which the two were placed in an oven and heated to a temperature of 300 degrees Fahrenheit. The purpose of this experiment was obviously to show that by the application of heat alone a celluloid blank would not take an impression by its



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own expansive force. The experiment was entirely unnecessary, since no one has contended in this case that satisfactory celluloid records could be made in this way, and both Mr. Wurth and Mr. Lambert testified in the Edison-Lambert interference that it could not be done. The point, as I have frequently said, is entirely outside of any consideration in this case, because this idea of causing a blank to take an impression by its own expansion force is made the subject only of claims 1 and 18, which are not sued on. As 698 an evident apology for not attempting in these particular experiments to expand the heated celluloid blank mechanically, as suggested in the patent in suit, Mr. Carter states that the presence of the end flanges on the Lambert blank would prevent the effective employment of a tapered mandrel. It is clear that if the end flanges are to be retained, some other form of expander would have to be used than a tapered mandrel, for example the expansible bag shown in figure 8a of Lioret's British patent. This of course 699 would be within the terms of the claims of the patent in suit and would be obvious to any mechanic. Mr. Carter also asserts that it would be impossible to make use of a tapered mandrel on account of the thinness of the wall of the Lambert blank, but in this respect he is entirely in error, since I have found it possible to make very excellent records by the exact process of the Edison patent in suit including the use of a tapered mandrel and wherein I made use of blanks formed by taking commercial Lambert records and cutting off the 700 end flanges. In these experiments the blanks were heated somewhat below 200 degrees Fahrenheit and were expanded by means of a tapered mandrel. I produce two of such records made by employing a Lambert blank, and also a third record made by employing a somewhat longer celluloid tube but of no appreciably greater thickness. These records are excellent in quality, as I have tested them on a machine. In order that I might not have to fit separate flanges to these exhibit records, I mounted them on a separate wax

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blank so that they would fit the mandrel of the phonograph.

Records produced offered in evidence and marked "Complainant's Exhibit Edison Process Celluloid Record No. 1, No. 2 and No. 3".

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40 Q. In answer to Q. 27 Mr. Carter refers to some experiments with thick celluloid blanks in his endeavor to make a celluloid record by the process of the Edison patent in suit. Do you regard these experiments as at all conclusive?

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A. No sir, I do not. In these experiments Mr. Carter found it impossible to make celluloid duplicates by the use of a tapered mandrel even when the blanks were very much thicker than those used by defendant, but he admits that the experiments "were carried on under conditions which in some respects were rather crude". What he did was to build up a blank of several sections, but he should have known that in doing so there would be inevitable play between the sections which would prevent the effective use of a tapered mandrel. He also admits that the blanks were quite variable in thickness and in diameter, and that they did not closely fit the matrix. An experiment carried out under these crude conditions dealing with the reproduction of impressions less than .001 of an inch in depth could hardly be expected to be successful. I have found it entirely

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practicable to make celluloid duplicates by employing a tapered mandrel out of the exact material used by defendant, as shown by the exhibits just introduced, so that obviously there would be no difficulty in making duplicates of thicker material. Mr. Carter calls attention to the fact that it would be very difficult to make a celluloid blank of a uniform diameter or bore, and suggests the great difficulty which would be encountered if it were attempted to turn off the celluloid in a lathe. Obviously no one would think of doing this, since celluloid can be readily softened in boiling water

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and forced over a mandrel of any desired size and shape. This, in fact, is exactly what defendant does.

41 Q. In answer to Q. 28 Mr. Carter says that neither Lioret, Young nor Edison realized that heating with steam was the only practicable method of softening the celluloid. Was this step in defendant's process a new idea in the manipulation of celluloid?

A. I cannot agree with Mr. Carter that heating with steam is the only practicable way of softening celluloid for this purpose, since I have found it entirely practicable to soften celluloid by a dry heat of less than 200 degrees Fahrenheit obtained by surrounding the mold with a closed chamber containing hot water. Mr. Carter is entirely wrong if he is of the belief that there was anything novel with defendant in suggesting that steam could be used for this purpose. Ever since the invention of celluloid, it has been well recognized that it could be softened by heat preferably by a moist heat such as by boiling water or steam. For instance, in Thorpe's "Dictionary of Applied Chemistry", London, Longmans, Green & Co., 1890, Vol. 1 page 450, the article on "Celluloid" says:

"Celluloid is highly inflammable but non-explosive even under pressure; hence it may be worked under the hammer or between rollers without risk. It softens in boiling water, and may then be readily molded or pressed into various forms."

In Appleton's American Cyclopedia (New York, D. Appleton & Co. 1883) Vol. 4, I quote from the article on "Celluloid":

"The Messrs. Hyatt obtained another patent in 1874 for a particular method of molding celluloid, as also pyroxylin etc. Owing to the inflammable nature of the pyroxylin, a special



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manipulation is required. The first part of the new invention consists in subjecting the material, in porous or other suitable molds, to the direct action of steam, which not only heats and softens the mass with great facility, but, by excluding the heated air therefrom, and immersing the material in steam, diminishes to a great degree the liability to combustion, while it absorbs more or less of the volatile solvents remaining in the material. \* \* \* For molding celluloid the temperature will range between 212 degrees and 300 degrees Fahrenheit, and consequently it requires a pressure varying from that of the atmosphere to 64 pounds above."

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42 Q. In answer to Q. 28 Mr. Carter expresses the opinion that it remained for Messer to devise the means which formed

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"the keynote to success in this line of manufacture, the final step crossing the line from commercial failure to commercial practicability."

Do you agree with this view?

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A. No sir, I do not agree with him, and in fact the only change made by Messer over the suggestion of the Petit patent No. 689118 of December 17, 1901 was the provision of a series of vents for permitting the escape of air from between the blank and matrix and for which Petit suggested an obvious equivalent. I do not regard this as anything more than a mere detail which hardly warrants Mr. Carter's enthusiasm.

43 Q. In answer to Q. 29 Mr. Carter expresses the opinion that the Edison patent in suit contributed nothing toward the ultimately successful process of manufacturing commercial celluloid records. Do you agree with him in this?

A. I do not agree with him in this matter. His opinion is based on what I regard as an incorrect un-

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ferred and whose inconclusive character I have at-  
tempted to explain. He has assumed that the Young  
process is exactly like that practiced by defendant,  
that Young made use of material as thick as that used  
by defendant, and that with the Young process the  
duplicates are contracted diametrically to clear the  
engaging surfaces and are then removed longitudinally.  
Concerning the Lioret process he has assumed that  
with that process a mold could be made as Lioret de-  
scribes, that with that process a sufficient diametric  
contraction can take place to separate the engaging  
surfaces and permit the phonogram to be removed  
directly without unscrewing it, and finally that with  
the Lioret process the presence of water or air between  
the blank and matrix could be readily prevented.  
Furthermore, he assumes that Edison does not describe  
in his patent in suit a practicable process for making  
celluloid duplicates, and he finally assumes that with  
the Lambert process it is impossible to make dupli-  
cates of a soaplike material as with the Edison  
commercial duplicates. Any one seriously enter-  
taining such views as these could hardly be  
expected to give a fair statement of the  
contribution to the art made by Mr. Edison in the pat-  
ent in suit. Mr. Lambert, who at the time of testify-  
ing in the Edison-Lambert interference knew as much  
about the manufacture of celluloid records as probably  
any man in the world and who was testifying in defend-  
ant's interest, said without any qualification that the  
Young process was entirely inoperative and that the  
Lioret process was even more inoperative. My own  
experiments fully convince me that the Edison process  
with a tapered mandrel is entirely practicable for mak-  
ing celluloid duplicates, and that the Lambert process  
using a fluid pressure expander is entirely practicable  
for making duplicates from a soaplike material. I  
have already indicated generally what Mr. Edison's

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contribution to this art was by the patent in suit, which may be thus summarized :

1. He was the first to suggest a process by means of which a duplicate phonograph record could be made which would be an accurate copy of an original record.

2. He was the first to suggest as a new manufacture a homogeneous integral duplicate record capable of use on a standard talking machine.

178 3. He was also the first to suggest a practical process for making duplicate records of celluloid.

4. He was also the first to suggest the expedient of diametrically contracting a duplicate record from a matrix or mold to a sufficient extent to clear the engaging surfaces and permit it to be directly removed by a longitudinal movement, and this was the suggestion that for the first time in the art made it possible to produce duplicate records in a continuous mold.

719 5. He was the first to suggest a process by which a blank was expanded into engagement with the mold so as to take a surface impression without change of shape or material displacement, the blank being sufficiently thick as to form a support or body for the record surface, so that it undergoes no change of shape either during the act of removing it from the matrix or subsequent to its removal from the matrix.

720 6. He was the first to suggest a complete process for making duplicate records that has been found peculiarly adapted for celluloid, wherein a blank sufficiently thick to maintain its shape during and after the act of removing it from the matrix is inserted in a matrix, softened by heat, expanded mechanically to take a surface impression, is then contracted diametrically, and is finally removed by a direct longitudinal movement.

All of these contributions to the art are used in the commercial manufacture of celluloid records and are the things that made that art a successful possibility. The variations from the details suggested in the patent in suit and adopted by defendant, while perhaps



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cheapening the operations, do not improve the results and are, after all, merely the inevitable refinements which follow all pioneer patents and which, although possibly patentable in themselves, do not carry defendant's operations outside of those contemplated by the patent in suit.

44 Q. In answer to Q. 32 Mr. Carter makes the statement that the use of the steam pressure in defendant's process is not sufficient alone to form the record, but that the subsequent air pressure is necessary. Does this fact, if true, serve to distinguish defendant's process from the process of the patent in suit? 722

A. I can hardly regard Mr. Carter's experiments in this respect, as being conclusive of anything, because it is simply incredible that steam under pressure should not result in the taking of an impression. Apparently all that Mr. Carter did was to turn on the steam alone at the pressure which with the Lambert process is not designed to effect the expansion but merely to soften the blank, namely, about 40 pounds. In practice, the Lambert Company use compressed air at a pressure of 80 pounds, and it is manifestly absurd to expect that steam at 40 pounds pressure would give the expansive effect of compressed air at 80 pounds pressure. What Mr. Carter should have done was to have used steam at a pressure of 80 pounds, and I believe that then he would have achieved success. However, the use by defendant of a separate air pressure to secure the expansion following the use of steam to make the material soft makes the defendant's process a closer approach to that suggested by Edison than if defendant used steam alone to perform the two operations of softening the blank and then expanding it. In other words, the use of steam to soften the material is the equivalent of Edison's suggestion of softening the material by heat, and the expansion of the softened material by compressed air is obviously but another way of expanding it mechanically than by a tapered mandrel as suggested by Edison. 723 724



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45 Q. In answer to Q. 35 Mr. Carter expresses the opinion that the Lioret and Young patents anticipate absolutely and completely in every essential particular claims 2, 3, 4, 5, 9, 10 and 17 of the Edison patent in suit. Do you agree with this conclusion?

Adjourned to May 20, 1904, same time and place.

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WEST ORANGE, N. J., May 20, 1904.

Met pursuant to adjournment.

Present, counsel as before.

DIRECT EXAMINATION OF FRANK L. DYER CONTINUED:

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A. No, I do not agree with this conclusion of Mr. Carter. As I have before said, the claims of the patent in suit were allowed by the Examiner after the Young and Lioret patents had been cited by him against Edison, Lambert and Joyce. Those patents had been very carefully considered by the several applicants, and had been distinguished by arguments presented to the Examiner in support of the several claims pending before him including those of the patent in suit. As a result of this unusually careful investigation the Examiner was convinced that these references did not in fact anticipate the Edison invention. In order that that invention might be fully distinguished from Young and Lioret, the Examiner therefore adopted the distinctions over Young which Lambert had called to his attention, namely, that the successful process should be one in which the blank is sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and in order to fully distinguish from Lioret the Examiner himself suggested the limitation to the withdrawal of the finished duplicate by a direct longitudinal movement, which of course presupposes a preliminary di-

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ametric contraction sufficient to clear the engaging surfaces.

In expressing the opinion that the claims here sued on are anticipated by the Young and Lioret patents, Mr. Carter assumes that these patents cover fully operative processes, and in this respect I do not agree with him, nor in fact did Mr. Lambert agree with him when he testified on the point in the Edison-Lambert interference.

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Mr. Carter regards the Young patent as anticipating the claims sued on only upon the assumption that the method disclosed by Young is like that practiced by defendant, and that the material used by Young is substantially as thick as that employed by defendant. Of course in these respects he is entirely in error, because I have shown that when the Young patent is carefully examined, it discloses an entirely different process from anything here involved and one which if it could be carried out would result in very weak, uncertain, imperfect and fugitive impressions. Furthermore, as I have pointed out, with the Young process the record is collapsed, whereas with the process as defined in the claims under consideration the record is contracted diametrically and then withdrawn by a direct longitudinal movement. Mr. Carter finds an anticipation in the Young patent of this particular step only upon the assumption that with the Young process the record is not collapsed but is in fact contracted in the same way as suggested by Edison. His opinion on this point is evidently based on the inconclusive experiments made by him which I have shown were not carried out in accordance with the instructions of the Young patent, nor did his conditions comply with the conditions set forth in the Young patent.

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Concerning the Lioret patent Mr. Carter merely expresses the bald opinion that this reference anticipates the terms of the claims here sued on, although in finding such anticipation in the reference he states without qualification that Lioret discloses the idea of

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May 20, 1904.

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"removing the phonogram from the mold by direct longitudinal movement". The Lioret patent distinctly says that the record is unscrewed from the mold, and I have shown that it cannot be removed in any other way, although in doing this the record surface will be injured, if not destroyed.

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Concerning the 17th claim, it is interesting to note that Mr. Carter considers it as being anticipated by both Young and Lioret, yet this claim was the issue of the Edison-Lambert interference, and Lambert had every opportunity afforded by the rules to show at that time that the claim was not patentable. He did, in fact, argue that Edison was not entitled to make the claim, but on this point he was not sustained by the Primary Examiner or by the Commissioner on appeal, both of whom decided that the claim applied just as effectively to the Edison process as to the Lambert process. Therefore so far as this claim is concerned, it is a fact that notwithstanding the Young and Lioret patents appearing in the record of both Edison and Lambert, the claim was considered by the Primary Examiner, by the Examiner of Interferences, by the Examiners in Chief, by the Assistant Commissioner of Patents, and by the Commissioner of Patents in person without any question being raised in the minds of any of those tribunals as to its patentability.

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Since the claims which are here sued on were very carefully considered by the Patent Office in view of the very references that Mr. Carter regards as anticipating them, and since it is perfectly evident that his understanding of the references is incorrect, I cannot subscribe to his views that the claims are not entirely patentable and novel.

46 Q. In answer to Q. 36 Mr. Carter expresses the opinion that the defendant's record is not made of a material "sufficiently thick to maintain its shape during and after the act of disengagement from the matrix" within the meaning of this expression as em-



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played in the Edison patent in suit. Do you agree with Mr. Carter in this matter?

A. No sir, I do not agree with him, and I have already explained that Mr. Carter evidently fails to understand what this expression means. In fact, nowhere in his deposition do I find that he has attached any significance to the words "and after" which appear in this quotation. According to the understanding between the Patent Office and Mr. Edison at the time the claims here involved were allowed, the expression in question meant that the material of the blank should be thick enough to receive a surface impression and at the same time present in its body a sufficient bulk of material to offer a satisfactory backing or support for the record surface so that the material should retain its shape *after the act of* disengagement from the matrix, and also that the material should be thick enough as to be capable of shrinking out of the mold without requiring collapsing, so that therefore it should retain its shape *during the act of* disengagement. I have shown from a consideration of defendant's records that the material offers a support or backing at least 40 or 50 times the depth of the very deepest indentations, and possibly several hundred times the depth of many of the indentations. Defendant's records comply absolutely with all the conditions of the claims and are fully distinguished from the special conditions of the Young patent in view of which the limitation in question was introduced and which in fact had been first brought to the attention of the Patent Office by Mr. Lambert.

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47 Q. Please state whether or not in your opinion the records at present made by the defendant are materially different from the thicker records formerly made by the defendant with respect to their embodiment of the characteristic denoted by the phrase "sufficiently thick to maintain its shape during and after the act of disengagement from the matrix"?

A. No sir. The records now made by defendant are from .040 to .050 of an inch in thickness, and for the



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reasons which I have previously explained and which appear on the face of the record itself such an article represents an embodiment of the characteristic denoted by the phrase which you quote. The records formerly made by defendant so far as I know were about .080 of an inch in thickness and therefore obviously presented a somewhat heavier wall for the support of the record surface; but it is perfectly evident, and I think it is not denied by Mr. Carter, that if the phrase quoted is

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given the meaning on which the minds of the Examiner and Mr. Edison met when the claims were allowed, the material used by defendant at the present time is in fact "sufficiently thick to maintain its shape during and after the act of disengagement from the matrix". Mr. Carter admits that with defendant's records they shrink out of the mold and therefore do not change their shape *during* the act of disengagement from the matrix, and since the defendant's records are not fugitive and retain their shape for an appreciable time sufficient for all practical purposes *after* the act of disengagement from the matrix, they comply with the requirement of the claims in this respect.

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48 Q. Can you produce one of these thicker Lambert records?

A. Yes sir, I produce one of the earlier records made by the Lambert Company marked "Light Cavalry Charge, Band, H. S. 396" and containing the superscription "Lambert Co., Chicago, Pat. Mch. 20, 1900". I cut a notch in one of the end flanges in order to

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measure the thickness of the wall with a micrometer.

Record produced offered in evidence and marked "Complainant's Exhibit Thick Lambert Record".

49 Q. In answer to Q. 37 Mr. Carter expresses the opinion that the process employed by the defendant is substantially different from that set forth and claimed in the Edison patent in suit and only similar thereto to the extent that both are identical with the prior

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processes of the Lioret and Young patents. Do you agree with this view?

A. No sir, I do not, and in fact have shown that with defendant's process the blank is sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and that the duplicate after it has been contracted diametrically sufficient to entirely clear the surfaces is removed by a direct longitudinal movement. Both of these distinguishing characteristics are not present in the Young and Lioret patents, and were in fact introduced into the claims here in suit for the purpose of distinguishing from the processes disclosed by those references. The claims are not only fully distinguished in terms from the references, but, as I have previously pointed out, the references are inoperative, in which respect Mr. Lambert agrees with me. The defendant in this case carries out the process of the patent in suit, and obviously carries out neither the process of the Young patent nor of the Lioret patent.

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50 Q. In answer to Q. 38 Mr. Carter expresses the opinion that the defendant, in manufacturing its celluloid records, does not follow the process set forth in the patent to Lambert No. 645920 of March 20, 1900. Do you agree with Mr. Carter in this matter?

A. No sir, I do not. Mr. Carter's opinion on this point is based entirely on the assumption that defendant at the present time does not employ a blank which is sufficiently thick to maintain its shape during and after the act of disengagement from the matrix. He admits that with the defendant's process the blank is contracted diametrically so that it obviously maintains its shape *during* the act of disengagement, and since the blank does not change its shape *after* the act of disengagement, the present blanks used by defendant comply with the requirement of this limitation in this respect. In my previous deposition (Q. 11) I fully considered this point and reached the conclusion that defendant's present method complies absolutely with the terms of the first claim of

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Lambert patent No. 645920, and I see no reason to change or modify this view in any respect.

51 Q. Can you produce one of the Lambert Co. records of the thinner variety which Mr. Carter says do not employ the invention of the Lambert patent of March 20, 1900 by reason of their thinness, which record bears the date of the Lambert patent of March 20, 1900?

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A. Yes sir, I produce a Lambert record marked "950, Belle of New York, Orch.", which is about .045 of an inch in thickness of wall and which contains the imprint on its end flange "Pat'd March 20, 1900". This record seems to be identical with those now made by the Lambert Company, and particularly in the thickness of material used, as shown, for example, in "Complainant's Exhibit Lambert Record and Separated End Flanges", and which present records contain the mark "Pat'd July 29, 1902".

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Record produced by the witness offered in evidence and marked "Complainant's Exhibit Thin Lambert Record".

52 Q. I call your attention to redirect questions 1 and 2 of the deposition of Mr. Philpot given for the defendant February 24, 1904. Do you agree with Mr. Philpot in his estimate of the superiority of defendant's celluloid records over what he refers to as the complainant's wax records?

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A. No sir, I do not, but on the contrary I regard the soap records made by complainant, which are what Mr. Philpot refers to as wax records, as being immeasurably superior to the celluloid records made by defendant. The metallic soap of which the Edison records are made is very much smoother than celluloid, so that the records are superior in quality to defendant's records, being substantially free from the rushing and crackling sounds which characterize all reproductions from celluloid records. Complainant's metallic soap records are much more permanent than celluloid



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records in the respect that the record surface does not  
undergo changes in character, so that the record is of  
the same quality at all times; on the contrary cellu-  
loid, owing to the evaporation of its solvent, constantly  
undergoes slight changes, so that the quality of a cel-  
luloid record gradually deteriorates. It is true that  
the surface of a celluloid record is much harder than a  
metallic soap record, so that it will wear longer, but  
complainant's records for practical purposes do not  
become worn, since it is possible to secure a thousand  
reproductions from one of these records without show-  
ing enough wear to be noticeable in the quality of the  
reproduction. These records are almost wholly of a  
musical character, having a relatively short popularity,  
so that a thousand reproductions would be much more  
than the average user would ever think of wanting. The  
non-breakable character of celluloid records on which  
Mr. Philpot lays so much stress is largely an adver-  
tising point, since in practice very few of complain-  
ant's records are broken, and the users soon accus-  
tom themselves to the proper care necessary in  
handling them. Metallic soap records are very  
much cheaper to manufacture than celluloid  
records because the material used is much  
cheaper than celluloid and the manipulations fol-  
lowed can also be much more economically carried  
on. At the present time the two large companies now  
in the field manufacture and sell more than 50,000  
metallic soap records daily, and such records as are  
made by complainant command a higher price than the  
celluloid records manufactured by defendant. The  
commendatory letters which Mr. Philpot quotes in his  
deposition are such as are received in large numbers  
by complainant and some of which have been printed  
in complainant's monthly publication. It seems to be  
the general idea in the trade that the Edison record,  
taken all in all, is a very superior article.

53 Q. Have you had prepared drawings illustrating  
by comparative views the processes of the Lioret and  
Young patents and the processes of the patent in suit

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and of the defendant; if so, kindly produce and explain them?

A. Yes sir, I produce four sheets of drawing in which I have attempted to illustrate diagrammatically the several processes which I have referred to in my testimony.

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Sheet 1 shows the Edison process of the patent in suit, A being the mold and B the blank. In figure 1 a small section of the blank on a greatly enlarged scale is shown within the mold. In figure 2 the blank has been expanded outwardly so as to take an impression from the mold. It will be observed that this impression is merely a surface impression and that a great body of material exists behind it to support and maintain it. In figure 3 the resulting duplicate is shown as being contracted diametrically so as to be capable of being withdrawn by a direct longitudinal movement.

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On sheet 2 I illustrate defendant's operations, which it will be observed are exactly the same as those of the Edison process except that the relative thickness of the blank is somewhat less. It will be noticed, however, that the blank offers a great bulk of material behind the record surface for supporting it—at least 40 or 50 times the depth of the very deepest indentations and probably several hundred times the depth of most of the indentations.

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On sheet 3 I illustrate the Young process. In figure 1 the blank is introduced into the mold, which has been first warmed or slightly heated so as to make the blank pliable. In figure 2 the pliable blank is shown as pressed gently up against the record surface so as to take the impression. In figure 3 I show how the blank is collapsed in order to remove it from the matrix as described by Young. In figure 4 I show the very thin duplicate record mounted on a support or backing C, the indentations in the thin blank being exaggerated. The objections to this expedient of mounting a thin shell on a separate backing have been already referred to and were clearly recognized and ex-



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plained by Mr. Lambert in his first patent as well as in the prosecution thereof.

On sheet 4 I illustrate the Lioret process. In figure 1 the record appears at *a* at the bottom of the channel formed by the threads, and the blank is shown in position ready to be expanded. In figure 2 the expansion has been effected and the material has been forced into this channel so as to engage the record surface at its bottom. I do not show in this figure any water bubbles or air bubbles, which in my opinion would be inevitably present to prevent this intimate engagement between the blank and the mold. In figure 3 I show the effect of longitudinal contraction tending to rip off the threads and make it very difficult to unscrew the resulting duplicate, as I have explained.

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Drawings referred to offered in evidence and marked respectively "Complainant's Exhibit Diagram Edison Process," "Complainant's Exhibit Diagram Defendant's Process," "Complainant's Exhibit Diagram Young Process" and "Complainant's Exhibit Diagram Lioret Process."

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Complainant's counsel also offers in evidence the several patents referred to by the witness which are not already in evidence, namely, United States patents of Edison 382418, 382419, 382462 of May 8, 1888, and 430278 of June 17 1890, the same being marked "Complainant's Exhibit Edison Patent No. 382418, No. 382419, No. 382462 and No. 430278" respectively.

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Also the U. S. patents of Herrington No. 397856 dated February 12, 1889, and No. 399265 dated March 12, 1889, and the same are marked "Complainant's Exhibit Herrington, Patent No. 397856 and No. 399265" respectively.

Also U. S. patents of Petit 689408 of December 24, 1901, 657956 of September 18, 1900, and 689118 of December 17, 1901, and the same are



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marked "Complainant's Exhibit Petit Patent No. 689408, No. 657956 and No. 689118" respectively.

Also figures 59, 60, 61 and 62 and the portion of the specification descriptive of those figures of Edison's English patent No. 1644 of 1878, and the same is marked "Complainant's Exhibit Extract Edison's English Patent 1644 of 1878."

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Also a certified copy of the file-wrapper and contents of the Lambert patent No. 645920 dated March 20, 1900, and the same is marked "Complainant's Exhibit Lambert File."

Also a certified copy of the file-wrapper and contents up to and including October 16, 1902 and also the drawing of the application of Maurice Joyce filed October 13, 1897, Serial No. 655027, and the same is marked "Complainant's Exhibit Joyce File."

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Complainant's counsel also gives notice that he will print as part of complainant's record the testimony and paper exhibits of both parties to the interference of Lambert v. Edison, such testimony being on file in this case in connection with the affidavit of John R. Taylor sworn to December 31, 1902 and referred to in said affidavit as "Exhibit E" and "Exhibit F."

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By MR. SHERIDAN: The production of these exhibits, particularly the Joyce files, Lambert files and proceedings in interference and the affidavit referred to, are objected to as incompetent, immaterial and irrelevant, as uselessly encumbering the record and adding to the expense of the suit.

CROSS-EXAMINATION BY MR. SHERIDAN.

54 x-Q. You speak quite positively, in answer to question 52, as to the business of complainant in this suit. Will you kindly state what your exact position is with complainant that enables you to give this information?

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A. All work in connection with patents and all legal matters connected with the complainant as well as of all Mr. Edison's companies are under my supervision and placed by me in the hands of such counsel as I may select. By reason of this fact I am familiar with complainant's business as well as the trade conditions generally.

55 x-Q. Then you are the legal adviser of the company as well as the expert in this suit, are you?

A. Yes sir.

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56 x-Q. Have you any financial interest in the company complainant?

A. No sir, none whatever.

57 x-Q. You were also the patent solicitor who prosecuted the Edison patent sued on as well as other Edison patents, were you not?

A. I was and am.

58 x-Q. In regard to the experiments carried on by you and which you have referred to in your foregoing deposition, results of which have been offered in evidence, was defendant or anybody connected therewith, as of counsel for defendant, invited to be present at such experiments?

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A. No one connected with defendant was present during the experiments you refer to, but whether invited or not I am unable to say. I should be glad to perform any of these experiments before you now or at any other time that may be convenient if you wish me to do so.

59 x-Q. Long before the date of the Edison patent in suit the making of matrices by a galvanoplastic process for the reproduction of embossed or molded phonograph records was old, was it not?

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A. Yes sir, the patent in suit refers to Mr. Edison's prior patent of October 18, 1892 as disclosing a suitable method of making the matrix or mold, but I am not aware that prior to the application for the patent in suit any practical method had been suggested for obtaining duplicate



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records from a matrix or mold however perfect the latter might be.

60 x-Q. Then this making of the matrix was old and well known before the dates of the Lioret United States patent No. 528273 dated October 30, 1894 and filed December 20, 1893, was it not?

A. Yes, sir.

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61 x-Q. I will ask you if the following is a good and practical description of making a matrix for the reproduction of phonograph records: First to take a wax cylinder and by means of recording stylus in the usual way produce a record thereon, and this carefully coat with plumbago or other suitable material capable of rendering the said wax surface of good electrical conductivity, then suspend the same in electrical plating bath and electrically connect the said prepared surface of the record with one pole of a suitable primary, secondary or other battery and connect the anode with the other pole of the battery according to

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the nature of the bath so as to produce a metallic deposit on said record, and provide or coat the same with a metallic surface; when sufficient deposit has been obtained, the latter is removed from the bath and exposed to a gentle heat until the wax has been melted and drained out of the hollow metallic cylinder; said cylinder is then fixed within an outer cylindrical or other shaped case of metal, or such casing may be cast around the cylindrical electro so as to provide a sufficient backing for the same?

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A. I think so, provided the plumbago is in very finely divided condition and is applied uniformly to the original master so as to entirely coat it without filling up the indentations of the record, and provided also that a metal is selected for the electrodeposition which will deposit uniformly.

62 x-Q. And that is substantially the process which the defendant company uses to make their matrices, as you understand it, is it not?

A. Yes, sir.

63 x-Q. And it is also substantially the process of

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making matrices described in the Young British patent No. 1478 of 1894 beginning with line 23 of page 3 to the end of that paragraph, is it not?

A. Yes, sir.

64 x-Q. And it was also well known in the art of reproducing phonographic record cylinders more than two years prior to the filing date of the Edison patent in suit that you could take and form a metal mold by electrodeposit upon an original phonographic cylinder, then place bodily within the so obtained mold a solid ring of plastic material capable of being softened by heat, next softening this ring by heat, and finally so distending the said ring within said mold by internal pressure that it will receive therefrom an impression corresponding with that of the original cylinder, was it not?

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A. The art of reproducing phonographic record cylinders as now practiced found its inception in the patent in suit, and that art as so understood did not exist before the application for the patent in suit. It is true that both Lioret and Young had hopes of success, but, as Mr. Lambert pointed out and as my experiments showed, these hopes were baseless. I make this explanation because your question is broader than the perfected art and contemplates the inoperative process of the Lioret patent. This being so, I agree with you that operations such as you suggest were described more than two years prior to the filing date of the patent in suit, but I do not admit that any operative process for making duplicate phonographic record cylinders was described more than two years before that application.

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65 x-Q. I will read you the third claim of the Lioret U. S. Patent No. 528273 of October 30, 1894, the application for which was filed on December 20, 1893:

"The method of reproducing phonographic cylinders which consists in first obtaining a metal mold by electro-deposit upon an original phonographic cylinder, next placing bodily



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within the so obtained mold a solid ring of plastic material capable of being softened by heat, next softening this ring by heat, and finally so distending the said ring within said mold by internal pressure that it will receive therefrom an impression corresponding with that of the original cylinder, substantially as herein described."

782 And ask you if this was not part of the patented art more than two years prior to the filing of the application of the Edison patent in this suit?

A. You have of course correctly quoted the third claim of this Lioret patent, which was granted more than two years before Mr. Edison's application, but since Lioret discloses an inoperative process it was certainly no useful contribution to the art.

66 x-Q. And if this third claim of the Lioret United States patent is valid, it covers and includes the process as carried on by defendant; in other words, if this claim is valid, defendant infringes it by the use of its present process; is that true or not?

Objected to as immaterial and incompetent.

A. Of course I know that the claim is not valid, first because of Mr. Edison's prior invention which was brought out in the Edison-Lambert interference with which I was connected, and second because the Lioret process is inoperative. I therefore cannot assume that the claim is valid.

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67 x-Q. I am not asking you as to the validity of the claim; the Courts will in due time determine that; I am asking you to assume the validity of the claim, as you are bound to do in the absence of a judicial decision to the contrary, and then to say in your opinion whether or no defendant's process as now carried on by it is an infringement thereof. Please answer categorically if you can?

Same objection.

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A. I cannot give an opinion on this point because I cannot assume that the Lioret process is operative ; but if it were operative and if it were possible to make a duplicate record as Lioret suggests and get it out of the mold without injuring its record surface, I should say that the differences between such a process and that practiced by defendant would be sufficient to distinguish defendant's process from the Lioret patent. Of course this opinion amounts to nothing, because my experiments have shown that the Lioret process is not operative and that the duplicate cannot be removed from the mold without injuring the surface.

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68 x-Q. Leave out of consideration any preconceived prejudices that your ill-advised and unsuccessful experiments may have instilled in your mind as to the inoperativeness of this process, and confine your answer to the claim and to the question as asked. The question is again repeated and a responsive answer to the question is respectfully asked.

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Complainant's counsel objects to the question as immaterial, and suggests that the witness is incompetent to say what limitations the Court might put upon the claim of the Lioret patent in order to sustain it in view of the prior work of Edison and in view of the peculiarities of the Lioret process even if operative.

By MR. SHERIDAN : Defendant's counsel respectfully suggests that the witness has not found any difficulty in removing or placing limitations on the patent sued on in view of the fact that that is generally considered to be the province of the Court, and sees no reason why this objection of complainant's counsel should be taken at this time as to this earlier Lioret patent, and repeats the question.

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A. I have no prejudices at all in this case either for or against the Lioret process. I had supposed that for years the inoperativeness of this patent had been



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generally recognized. Certainly Mr. Lambert, who was more familiar with the manufacture of celluloid records than anybody who has so far appeared in this case, had no hesitancy in expressing a positive opinion on the point, and at that time was testifying for defendant's interest and against Mr. Edison. The experiments which I made with the Lioret process were not ill-advised, because if an experiment can be made a

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success the Edison laboratory affords the best opportunities in the world for carrying it out. When I undertook these experiments I had no other purpose in mind than to carry out the exact language of the Lioret patent, but I found that that was entirely hopeless and tried all sorts of ways to make it work, even going so far as to drop the idea of a steel master entirely and using a wax master. I found that the Lioret process is absolutely inoperative in principle as well as in details, so that my experiments confirmed Mr. Lambert's opinion. Of course claims of a patent

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are not looked upon as a mere collection of words, and it is simply impossible for me to make your assumptions and express an opinion that would serve in any way to guide the Court on this question.

69 x-Q. Then you confess that you cannot disassociate the language of the claim from your experiments, and that you are incapable of expressing an opinion as to whether or no defendant's process comes within the terms of this third claim of the Lioret patent?

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Same objection.

A. I have no settled conviction on this point other than that based on my knowledge of the inoperativeness of the Lioret patent. I previously suggested that if the Lioret patent was operative and valid, it was probable that the process as practiced by defendant, owing to the differences between the two and the different character of products obtained, might not comply with the language of the third claim of the



Lambert, who was of celluloid records used in this case, positive opinion on verifying for defendant. The experimental process were not it can be made as the best opportunity out. When I another purpose language of the that was entirely to make it work, of a steel master I found that the at the in principle experiments confirmed claims of a patent ion of words, and make your assumption would serve in any ion. I cannot disassociate your experiments, giving an opinion as comes within the patent?

this point other the inoperatively suggested that and valid, it was practiced by between the two and obtained, might not find claim of the

Lioret patent if properly construed to covered the Lioret invention.

70 x-Q. As I understand you, your objection to the Lioret patent and the claim of which we have been talking is founded on the fact that you deem the process, either taken partially or as a whole, inoperative, in that Lioret did not, according to your light, disclose a practical method of making a matrix and a practical method of separating the finished product from the matrix; is that true or not?

A. Yes, and for the additional criticisms which I have applied to the Lioret process.

71 x-Q. Briefly state your additional criticisms.

A. First, with the Lioret process it would be impossible to exclude water from the space between the blank and mold, and consequently it would be impossible to cause the blank to intimately engage the mold at all points. Second, since the record itself is located at the bottom of a relatively deep channel, the material has to be displaced to a correspondingly great extent, and it would be much more difficult and perhaps impossible to get as accurate an impression this way as from a record whose maximum depth is less than .001 of an inch and in taking which the material has to yield to a correspondingly slight extent.

72 x-Q. Was the patent in suit the first publication or patent to teach the public how the moisture and air of your first objection could be eliminated?

A. Practically, yes, as far as I know. Perhaps with the Young process there might not be so much difficulty in this respect, since with the Young process the water is left out and the very thin blank is heated from the warmed mold. At the same time a very thin blank such as Young describes would be much more likely to trap air, since its surface is more or less pliable, than would a blank of the thickness contemplated by the patent in suit.

73 x-Q. And you consider that this first objection was a very serious objection, which the inventors had

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to overcome before designing a perfect practical process for reproducing phonographic records, do you?

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A. By "first objection" I presume that you mean the trapping of the water or air which I have referred to as one of the objections incident to the Lioret process although not necessarily an objection in the principle involved. This trapping of air or water would, in my opinion, be a practical objection which would have to be cured before the Lioret process could be carried on even if not inoperative in principle.

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74 x-Q. And it is for these reasons that you think the Lioret patent should not be given any force or effect; is that true?

A. In my opinion the Lioret patent has no bearing on the patent in suit, first because it is inoperative for the several reasons stated, and second because it is a different process for the reasons also stated and which were recognized by the Patent Office when the claims for the patent in suit were granted.

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75 x-Q. Is it not true as a condition precedent to obtaining a patent that it is only necessary to disclose the invention or subject-matter thereof with sufficient precision *to enable those skilled in the art* to practice the same?

A. Yes, and the more common the art becomes, the less precision is required.

76 x-Q. The statute and rules only require that at the end of the specification you should point out that which you consider to be new and which in modern practice means the paragraphs called "claims" of the patent; is not that true?

A. Section 4888 of the Revised Statutes provides that the inventor

"shall file in the Patent Office a written description of the same (his invention or discovery) and of the manner and process of making, constructing compounding and using it, in such full, clear, concise and exact terms as to enable

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any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound and use the same \* \* \* and he shall particularly point out and distinctly claim the part, improvement or combination which he claims as his invention or discovery."

77 x-Q. And the United States Patent Office on the 30th day of October 1894, after due and lawful proceedings had been had by its officers, did grant unto H. J. Lioret Letters Patent of the United States No. 528273—a patent covering (see claim 3)

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"The method of reproducing phonographic cylinders which consists in first obtaining a metal mold by electro-deposit upon an original phonographic cylinder, next placing bodily within the so obtained mold a solid ring of plastic material capable of being softened by heat, next softening this ring by heat, and finally so distending the said ring within said mold by internal pressure that it will receive therefrom an impression corresponding with that of the original cylinder, substantially as herein described."

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thus putting the stamp of approval upon all of his actions: *first*, that he had complied with the statutory requirements; *second*, that his method was fully operative; *third*, that he had described it with sufficient precision to enable those skilled in the art to make or practice his invention; and *fourth*, that he had pointed out clearly at the end of the specification that which he considered to be new. Is that true or not?

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A. Of my own knowledge I do not know whether the proceedings connected with the grant of this patent were the usual proceedings or that the patent was lawfully issued. It is a fact that Lioret did obtain the patent to which you refer which was cited against the



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Edison application and also against the Lambert case and with which everybody was perfectly familiar. This patent relates to a phonograph, and the only part which has to do with the present case is the brief matter found in the second column of the second page and covered in the third claim; all the rest of the patent and the remaining four claims relate to other matters.

78 x-Q. And at the date of the Lioret patent it was well known in this particular art that you could make  
806 a perfectly satisfactory matrix by the galvanoplastic method. Is that true or not?

A. Yes sir. As I said, Mr. Edison disclosed the manner of making the matrix or mold in his split mold patent of 1892.

79 x-Q. Now taking the perfectly satisfactory matrix either split or solid, and taking and practicing this part of the Lioret process,

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"placing bodily within the so obtained mold a solid ring of plastic material capable of being softened by heat, next softening this ring by heat, and finally so distending the said ring within said mold by internal pressure that it will receive therefrom an impression corresponding with that of the original cylinder",

would you not have a perfectly practical process for reproducing celluloid or other records, leaving out of consideration the removal of the completed phonographic record from the matrix?

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A. As I understand your question you want to know if, instead of using the particular kind of a master record described by Lioret and the particular kind of a mold or matrix obtained by him, we use a different kind of a matrix or mold obtained from a different kind of master and place within this matrix or mold a blank cylinder which, instead of being expanded as described by Lioret so as to be materially displaced and engage a relatively remote record surface, is caused merely to take a surface impression against the surface

of a mold whose greatest depth of indentation is less than .001 of an inch, whether such process would be a practical one; and to this I reply that it would not, because your question does not contemplate the exclusion of water and air from between the blank and the mold.

80 x-Q. Please point out in the patent sued on all reference to moisture and air in the production of celluloid or other records, and also where the patent in suit points out how this specific objection can be overcome? 810

A. The specific objection is not present in a process in which no opportunity is offered for the entrance of water between the blank and mold and in which a relatively thick blank is expanded uniformly so as to drive the air out from between the surfaces. The process of the patent in suit, even to its specific details, is a fully operative process which has been practically carried out commercially.

81 x-Q. Is it not a fact that the Messer patent No. 705772 of July 29, 1902 is the first patent to recognize this objectionable feature of trapping steam, moisture and air, and the first patent, so far as you are aware of its commercial reduction to practice, that provides for the elimination of this objectionable feature? I call your attention to the matter on page 2 of the Messer patent beginning at line 46 with the words "When steam" etc. down to the end of the paragraph on line 121 of the same page. 811

A. No sir. Any practical process for making duplicates must provide for the escape of air (or moisture if it is used), and in any process using a relatively thick blank, as suggested in the patent in suit, and not using hot water in which the mold and blank are immersed as suggested by Lioret, the air will naturally escape. Thus in Lambert's patent No. 742454 of October 27, 1903 (application filed June 14, 1900), it is stated. 812

"The natural irregularities of the adjacent surfaces of the matrix and base thus afford a



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sufficient opening between the lower end of the matrix and base to permit air to escape from between the record cylinder and matrix".

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Another example of this practice is found in the patent to Petit No. 689118 dated December 17, 1901, in which air from between the blank and matrix would escape into the space in which the packing 5 is located. Of course any practical process must provide for the intimate engagement of the blank with the matrix, and any process that does not provide for the elimination of any foreign fluid or liquid between the two will be impracticable.

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82 x-Q. Then according to your answer it was not the patent in suit that first publicly gave knowledge of this objectionable feature in unmistakable language and which showed how a process in which this objectionable feature was likely to occur could be carried on and such feature eliminated?

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A. Your question is not clear, but as I understand it, the patent in suit was the first disclosure of a practical process for making duplicates of celluloid or other material and, being a practical process, it provided for the intimate engagement of the blank with the matrix surface and therefore necessarily excluded any foreign liquid or fluid between those surfaces. The patent in suit states that "the blank will be further expanded mechanically into absolute intimacy with the record" (page 2 lines 49-51), thereby necessarily including the simultaneous expulsion of the air from between the surfaces.

83 x-Q. Does not the Lioret patent state (page 2 beginning at line 100):

"The celluloid is thus softened, and I then introduce forcibly into the said collar or ring *c* a mandrel *a*<sup>2</sup> sufficiently large to dilate the said ring or collar and cause it to penetrate into all the cavities of the mold *a*<sup>1</sup>"?

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A. Yes sir, although I do not agree with the correctness of this statement.

84 x-Q. You are positive, are you, that a threaded cylindrical celluloid or other phonographic record cannot be made in accordance with the general principles disclosed in the Lioret patent and removed from the matrix without damaging or injuring the phonographic record—I mean removed from a solid matrix and by direct longitudinal instead of helical movement?

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A. Yes sir, I am convinced of the inoperativeness of the Lioret patent and the impossibility of making a duplicate celluloid record after the process described therein without injury, if not destruction, to the record surface.

85 x-Q. Time and again in your direct examination you have stated substantially that even if a satisfactory mold could be made having threads therein and you were to force into such threaded matrix a celluloid record, it could not be removed therefrom without doing violence or injury to the sound record thereon. Is that not true?

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A. That is my belief.

86 x-Q. I hand you a threaded celluloid record and a matrix from which you can take my word it was made (or not as you prefer) and in which the completed record has been placed and carried for a thousand miles or more, and ask you whether you think such record could be made in such a matrix and removed therefrom or not?

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A. I have examined the record and the mold which you hand me under the microscope, and find that it appears to be formed with an excessively shallow thread about  $\frac{1}{10}$  of an inch wide at its base and about .001 of an inch in height, because I note that on the mold many of the projections which correspond to the depressions in the record are substantially as high as the thread, or in other words, the recorder in forming the record substantially cut down through the entire thread. It is possible that with a mold of this character a duplicate record might be contracted diametrically



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and removed longitudinally, but I have never verified the experiment and cannot say it of my own knowledge. So far as I can see, the record and mold which you hand me represent a mere *tour de force*, since there would be no advantage whatever in cutting these very shallow threads on the record, and there is the very great disadvantage that a duplicate made in this way could not be used effectively on standard talking machines.

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87 x-Q. Your objection to the British patent to Young No. 1478 of 1894 is that it is your opinion that in order to remove the completed plastic cylindrical phonographic record, it must be collapsed; is that true?

A. That is one of my objections, and that is exactly what the patent says.

88 x-Q. It is a well known natural phenomenon that with few exceptions all materials expand when heated and contract when cooled or deprived of heat,

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is it not?

A. That is generally true, unless of course there are opposing forces counteracting the molecular changes.

89 x-Q. I am asking a general question and would like to know whether it is true or not?

A. Yes, generally speaking.

90 x-Q. Is there any reason to believe that this natural phenomenon would be suspended in the practicing of the processes of either the Lioret or Young patents?

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A. In connection with the Lioret process the very contraction which the finished duplicate is subject to makes it very difficult to get it out of the mold and results in damage to the record surface. In the Young process however, two things are to be borne in mind: *first*, that normally the blank is slightly larger than the bore of the matrix, so that even when the two are fully cooled there would be no tendency to a separation; *second*, dealing with a very thin material which has been first made pliable by heat and then pressed into intimate engagement with the matrix, it is prob-



able that the atmospheric pressure would be enough to overcome the contractive tendency exerted within the minute body of material; at any rate, Young states that he does collapse his duplicates, this fact was recognized in the Patent Office, and no statement to the contrary appears in the patent.

91 x-Q. Then we are to take it, after reading your entire deposition, that natural laws generally obey the intent of the designer no matter in what form he harnesses them, and not the laws of the Maker or Controller of the universe? 826

A. I hardly think you are serious in this question. Sometimes when operations are witnessed very superficially the full significance of the phenomena involved may not be appreciated, but when anything is fully understood it is generally not difficult to find confirmation therein of some well recognized natural law.

92 x-Q. Then please tell me how anybody practicing the Young process could prevent the diametrical shrinkage of the record during the process of cooling the same? 827

A. For the reasons which I have stated: *first*, that with the Young process we are dealing with a very thin material which of itself presents a very small body or mass and consequently is able to exert a very slight contractive tendency; *second*, because with the Young process we are dealing with very low temperatures since the patent states that the matrix is merely warmed or slightly heated, and that the thin shell is made pliable by the gentle heat which is given off from the matrix; *third*, because dealing with very low temperatures we naturally encounter but a slight reduction in temperature, so that the contractive tendency, if it could be exerted, would be very slight; *fourth*, because with the Young process the blank is normally slightly larger than the bore of the matrix, so that when the blank is entirely cooled it would still be jammed tightly in position; *fifth*, because owing to the very slight mass which such a body presents, it is 828



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probable that the atmospheric pressure would be sufficient to overcome any contractive tendency, so as to hold the blank in firm engagement with the mold. Whatever may have been the reason for the phenomenon presented, it is a fact which Young makes perfectly clear that in removing his duplicates he did in fact collapse them and to this extent change their shape. Another reason which convinces me that Young removed his duplicates in this way is that he probably did not recognize the possibility of shrinking a duplicate out of the mold, because he describes the operation of melting out the original master from the matrix. At the present time it is only necessary to apply cold to shrink these masters out, and the masters can then be saved. This is done by both defendant and complainant herein.

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93 x-Q. And all of your conclusions in regard to the Young process which you have stated in your last answer are academic, are they not?

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A. No, sir. What I have stated concerning the Young patent is founded on the face of the patent itself as well as upon the expression of Mr. Lambert's opinion, who said that he had tried to make records in accordance with the Young patent but without success, and when Mr. Lambert made this statement he was testifying in defendant's interest.

94 x-Q. Well let us put it another way: You are simply founding your conclusions on hearsay; is that true?

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A. No sir, because during the Edison-Lambert interference very thin records or portions of very thin records were presented by Mr. Lambert and which I examined, from which it appeared that the impressions were as he had said—faint, indistinct and fugitive.

95 x-Q. Did you witness the demonstrations of Mr. Carter and the results produced by him which he stated were made in accordance with the principles of the Young patent?

A. No sir, I did not.



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96 x-Q. Have you ever made any such experiments or demonstrations yourself?

A. I tried to expand a very thin blank in a matrix by compressed air, but was unable to get any impression at all, as there was not enough body of material to make a seal, and I therefore regarded the experiment as being entirely inconclusive.

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97 x-Q. Generally speaking, your experiments which were favorable to the patent in suit were always successful, but those which might cast any reflections on its validity were unsuccessful; isn't that true?

A. It is not, and I am perfectly willing, as I said before, to reproduce any experiments which counsel wishes to have made, or to give him or anybody else that he may mention the full use of the Edison laboratory for making such experiments.

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98 x-Q. Defendant made a lot of experiments at which complainant was invited to attend and was represented and I think they stand for themselves, as contradistinguished from experiments which you made and to which neither defendant nor defendant's counsel was invited or was present, and I will ask you, therefore, to point out what experiments you made which might in any way reflect on the patent in suit that were successful?

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A. I have made no experiments whatever that in any way reflect on the patent in suit. If you have any doubt as to the correctness of my experiments or as to the deductions which I have drawn from them, I shall be very glad indeed to reproduce them for you. I believe, however, that no one can possibly question the entire correctness and the conclusive character of all of my experiments.

99 x-Q. Well we will let them speak for themselves, as well as Mr. Carter's, and let the Court draw its conclusion. You insist, do you not, that Young must be limited to a record which must or shall collapse during its withdrawal from the matrix?

A. That is what Young describes and nothing else.



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100 x-Q. You also insist that Lioret in his United States patent must be limited to a process in which a helical matrix is used and in which a helical disengaging action occurs, do you not?

A. That is exactly what he describes.

101 x-Q. You also insist that neither one of these patents, although they are earlier in date than the Edison patent in suit, is entitled to the broad general principle of the doctrine of equivalents?

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A. I make no such allegation, and will correct you in your statement that these patents antedate Edison's invention. You have evidently forgotten the fact that in the Edison-Lambert interference Mr. Edison successfully carried his date of invention back to October 1888, which was accorded him by all the tribunals of the Patent Office.

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102 x-Q. You have also evidently forgotten the fact that there is a statutory bar to carrying the invention back of a patent which is two years older than the filing date of the patent in suit, have you not?

A. Hardly.

103 x-Q. It is your opinion, however, that this later Edison patent which is in this suit is not in any way limited to the specific process disclosed therein, but that it is entitled to the beneficent doctrine of equivalents; is not that true?

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A. The patent in suit, in my opinion, represents the first disclosure of a practical process for making duplicate records of celluloid or other material and stands at the foundation of the art. It represents the first instance of a process in which a duplicate record sufficiently thick to maintain its shape during and after the act of disengagement is removed from a continuous mold by a diametric shrinkage followed by a direct longitudinal removal. As to what the patent covers is very clearly embraced in the claims and will be apparent from a consideration of the prosecution of the application therefor, from which it will be seen just what the Patent Office was willing



Lioret in his United States patent process and in which a helical process is not?

ribes.

neither one of these is in date than the Edison patent to the broad general claims?

and will correct your statement antedate Edison's forgotten the fact that since Mr. Edison's invention back to October 1877 all the tribunals of

ly forgotten the fact of carrying the invention years older than the Edison have you not?

however, that this later it is not in any way disclosed therein, but the doctrine of equivalence

pinion, represents the process for making duplicate material and stands represents the first in duplicate record sufficient during and after the patent from a continuous followed by a direct at the patent covers in the claims and consideration of the therefor, from which it patent Office was willing

to grant Mr. Edison for the purpose of covering his process.

104 x-Q. When did Mr. Edison or his successors or anybody under his authority place records on the market which had been made commercially by the process of the patent in suit?

A. Duplicate records made by the process of the patent in suit were first used commercially I think about 1898, being employed as masters from which to make duplicates by a mechanical duplicating process, as referred to by Mr. Edison in the testimony given by him in the Edison-Lambert interference. Duplicate phonograph records made under a process which is included by the patent in suit were first sold commercially about February 1, 1902. 842

105 x-Q. Please state, in as brief a space as you can, the process which complainant is now using in the reproduction of its records for the public market?

A. At the present time complainant is using a process in which the metallic soap mixture is maintained in a molten condition at a temperature a few degrees above its congealing point. A cold mold is then immersed in this mixture, and by reason of its lower temperature a considerable layer of the metallic soap congeals on the inner surface of the mold. The mold is then removed and the congealed mass, which quickly solidifies, is finished on its interior. The mold with the duplicate therein is then put over a cooling core through which water circulates, so that the duplicate will be chilled and caused to contract diametrically to clear the engaging surfaces. After this contraction the duplicate is removed longitudinally, and is then finished on its ends ready for the market. Duplicates to the number of many thousand daily are made by this process. 843 844

106 x-Q. Have you or Mr. Edison obtained a patent on this process, and if so, kindly state the number and date?

A. The specific process which I have described is covered and specifically claimed in patent to



845

Miller and Aylsworth No. 683,615 dated October 1, 1901.

107 x-Q. Is this an analogous process to the one patented in the patent in suit?

A. Yes, to the extent that it embodies the invention defined in the second and third claims of the patent in suit, which covers broadly the formation of a record in any way and its subsequent removal by a diametric contraction and a direct longitudinal withdrawal. As

846 I stated, these claims were involved in interference with an application of Joyce which described a casting process in which molten material was introduced into the mold around a core and then allowed to set or harden.

108 x-Q. Is not the process described in the Edison patent 667,662 of February 5, 1901, also an analogous process?

847 A. Yes, sir; the second and fourth claims of this patent also cover the process which complainant uses commercially, these claims covering broadly a process in which a molten material is introduced into the mold and after being allowed to set is contracted diametrically and then removed by a direct longitudinal movement.

109 x-Q. When did you abandon the specific process set forth in the patent in suit for the process which you now carry on?

848 A. I am unable to say when the manufacture of mechanical duplicates was entirely given up, but I believe it was sometime subsequent to the introduction of the Edison molded duplicates on February 1, 1902. As I said before, the specific process of the patent in suit was used for making masters for this mechanical duplicating process, so that the process was carried on commercially up to the time of the abandonment of mechanical duplicates.

110 x-Q. How long after February 1, 1902, did this occur—six months, a year, or how long?

A. My best recollection is that it was on July 1,

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1902, that the manufacture of mechanical duplicates was given up.

111 x-Q. Did the complainant Mr. Edison, or any of the complainant's predecessors, ever make and market celluloid records in accordance with what you understand to be the terms of the patent in suit, or did it ever make and market any celluloid cylindrical phonographic records?

A. Not that I know of.

850

By MR. SHERIDAN: Defendant's counsel asks the notary to mark this threaded matrix and record, which is already marked "Screw #34704," for purposes of identification.

Signature and certificate waived.

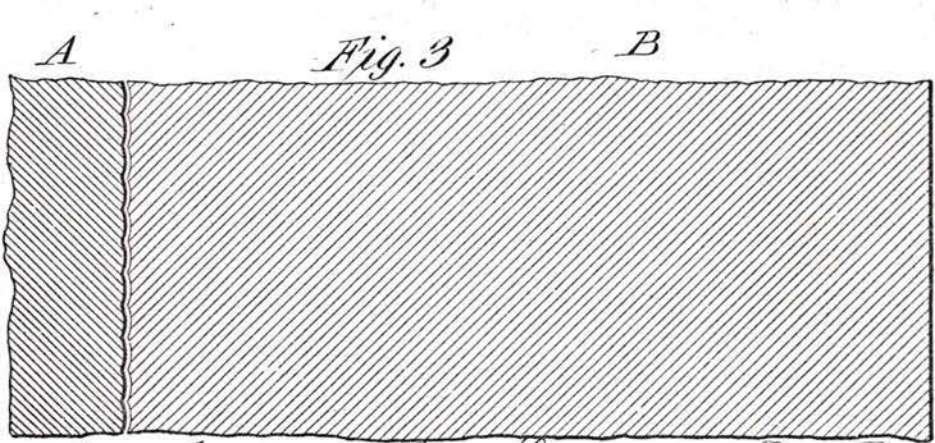
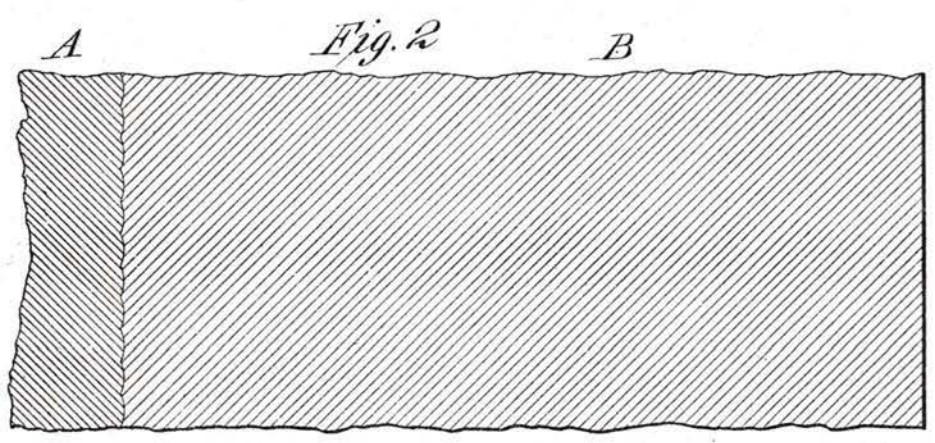
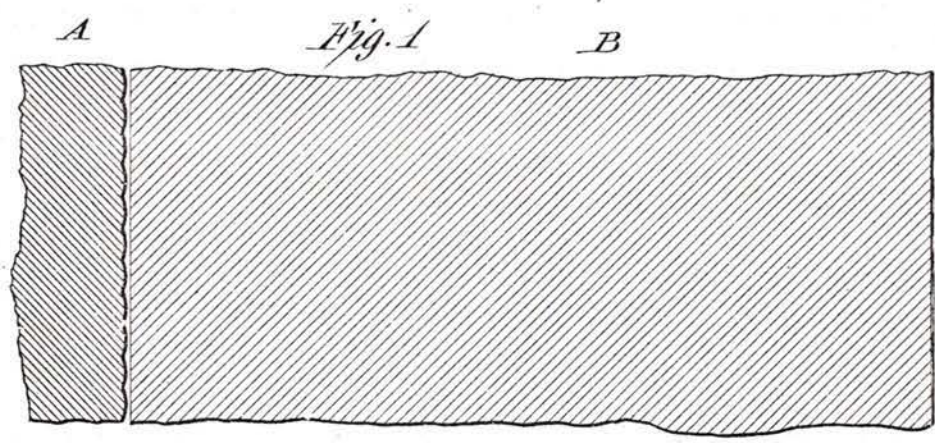
Complainant's counsel, in view of the attitude of defendant's counsel on the cross-examination of this witness, offers to have the witness repeat the experiments about which he has testified in the presence of defendant's counsel, beginning 851 at the present moment and continuing until the experiments are finished, and also offers to present the witness for further cross-examination after the experiments have been made in the presence of defendant's counsel.

852





Sheet 1

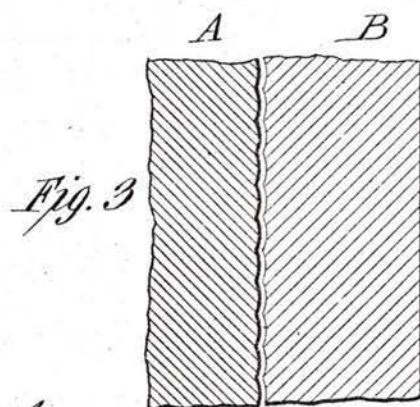
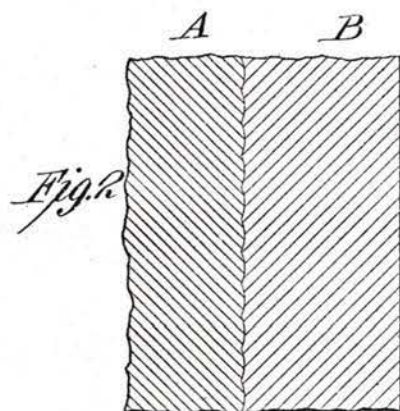
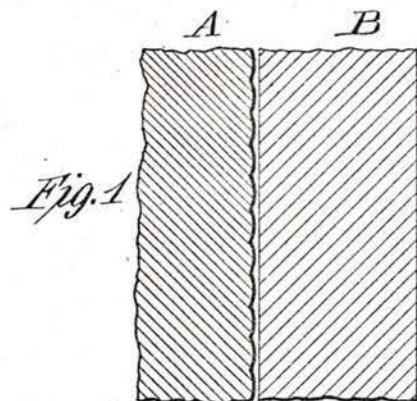


*H. S. Hermit, Inventor,  
Northern District of Illinois,  
Northern Division*  
*National Phonographs  
vs.  
Lambert Company*  
*Complete Exhibit Diagram Edison Process.  
J. P. K.  
N.P. vs. P. Co.*  
*In Equity  
No. 26,598*





## Sheet 2

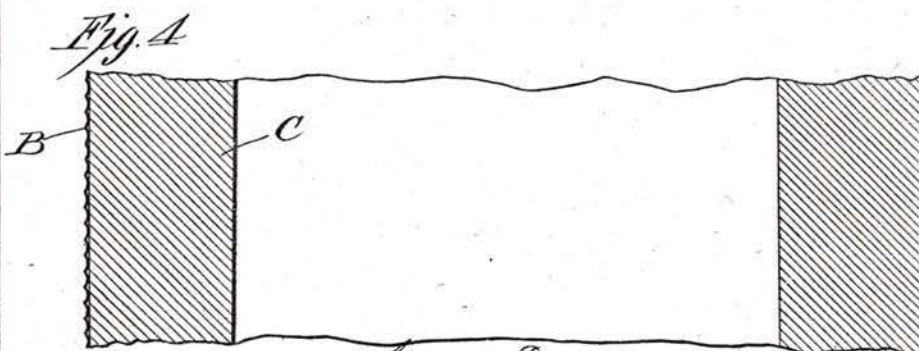
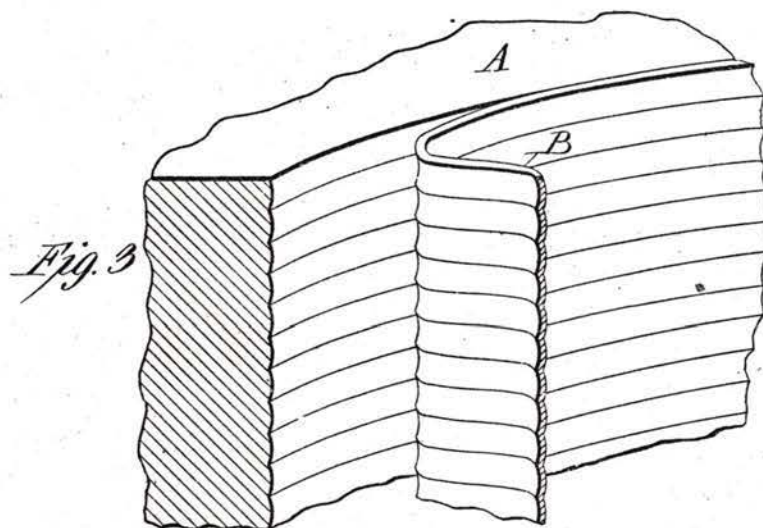
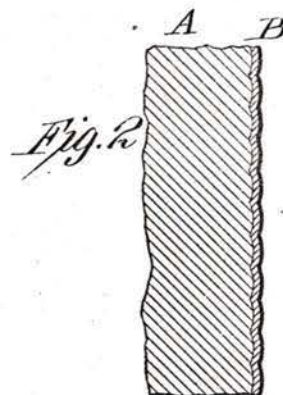
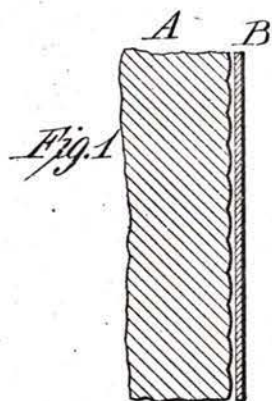


U.S. Circuit Court,  
Northern District of Illinois, Complete Exhibit Diagram  
Northern Division  
National Phonograph Co. } In Equity  
vs. } No 26,598.  
Pembert Company, Dep. }  
Dependant's Process.  
J.H.R.  
V.P. & Spl. Sec.





## Sheet 3



U.S. Circuit Court, Northern District of Illinois,  
Northern Division  
National Phonograph Co. & M. Equity  
Lambert Company, Inc. No. 26,598

Complete Exhibit Diagram Young Process.  
J. R. W. V. & Co.

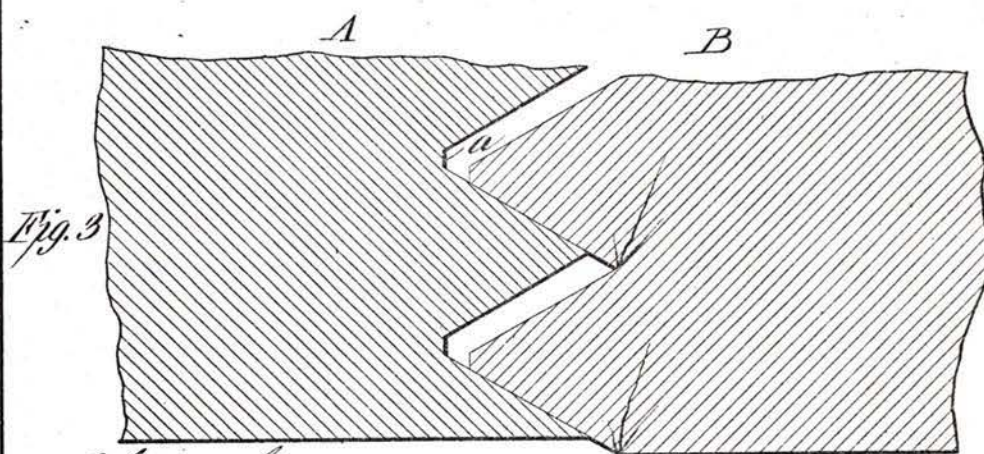
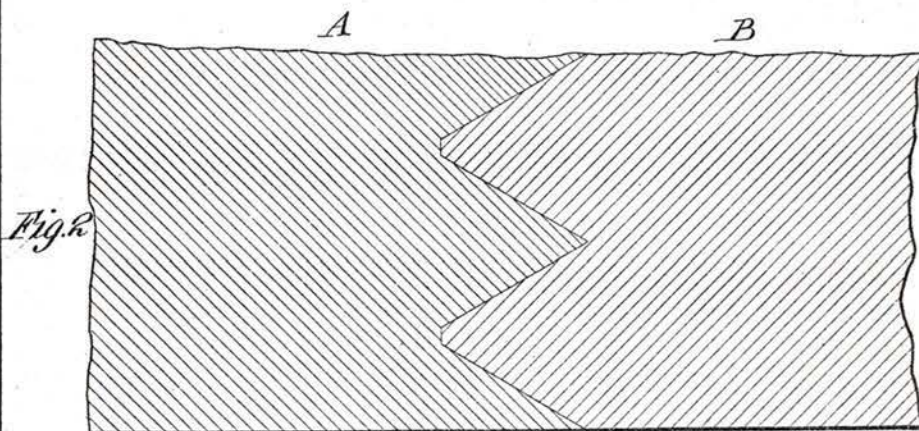
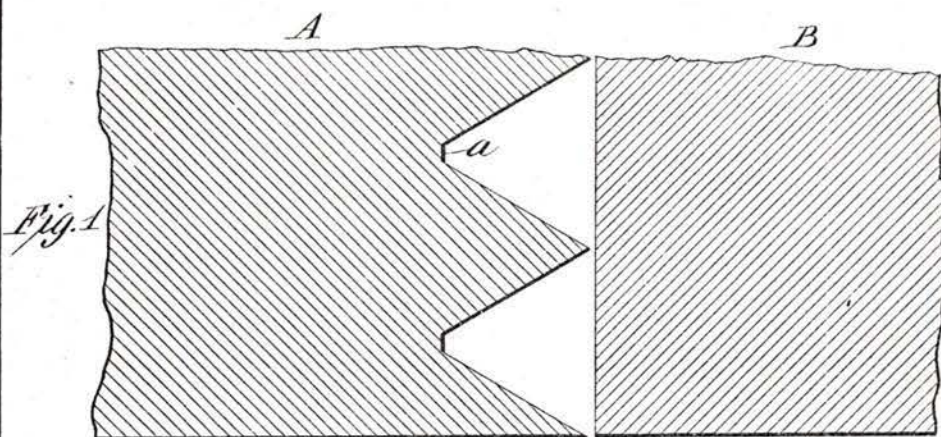




391



Sheet 4



U. S. Circuit Court  
 Northern District of Illinois  
 Northern Division  
 National Phonograph Co.  
 vs  
 Lambert Company

Complainant's Exhibited Diagrams  
 Processed J. J. R.  
 In Equity N. B. & Spl. Ex.  
 No. 26598



861

## U. S. CIRCUIT COURT

NORTHERN DISTRICT OF ILLINOIS—NORTHERN DIVISION

NATIONAL PHONOGRAPH Co  
Complainant

vs

LAMBERT COMPANY  
DefendantIn Equity  
No 26598

862

**Complainant's Exhibit Complainant's  
Certificate of Incorporation. M. P. S.,  
Sp'l Ex'r.**

THIS IS TO CERTIFY, That We, GEORGE H. LAMBERT,  
FRANCES B. STEWART and JOSEPH K. FRANKS do hereby  
associate ourselves into a company, under and by  
virtue of the provisions of an act of the Legislature of  
New Jersey, entitled: "An Act concerning Corpora-  
tions," approved April 7th, 1875, and the several sup-  
plements thereto, for the purposes hereinafter men-  
tioned, and to that end we do by this our certificate  
set forth:

863

FIRST: That the name we have assumed to designate  
such company, and to be used in its business and deal-  
ings is NATIONAL PHONOGRAPH COMPANY.

864

SECOND: That the place in this State where the busi-  
ness of such company is to be conducted is the City  
of Orange in the County of Essex and State of New  
Jersey, and that the objects for which the said com-  
pany is formed are to engage in the manufacture and  
sale of phonographs and phonograph appliances and  
supplies; to purchase and sell the stock of other cor-  
porations; to purchase patents, claims and debts; to  
purchase lands, buildings and machinery; to erect  
buildings; and to carry on a general manufacturing  
business.



865

THIRD: That the total amount of the capital stock is Ten Thousand Dollars; the number of shares into which the same is divided is one hundred and the par value of each share is One Hundred dollars. The amount with which said Company will commence business is One Thousand dollars, which is divided into ten shares of the par value of One Hundred dollars each.

866

FOURTH: The names and residences of the stockholders, and the number of shares held by each, are as follows, to wit:

George H. Lambert Newark, N. J. Eight shares

Francis B. Stewart Newark, N. J. One share

Joseph K. Franks, Newark, N. J. One share

FIFTH: The period at which said Company shall commence is the twenty seventh day of January Eighteen Hundred and Ninety six, and the period at which it shall terminate is the twenty seventh day of January Nineteen Hundred and forty six.

867

IN WITNESS WHEREOF, we have hereunto set our hands and seals the twenty fifth day of January Eighteen Hundred and Ninety Six.

GEORGE H. LAMBERT (L. S.)

FRANCIS B. STEWART (L. S.)

JOSEPH K. FRANKS (L. S.)

STATE OF NEW JERSEY }  
County of Essex } ss. :

868

BE IT REMEMBERED, That on this twenty fifth day of January in the year of our Lord One Thousand Eight Hundred and Ninety Six before me, the subscriber, a Master in Chancery of New Jersey personally appeared George H. Lambert, Francis B. Stewart and Joseph K. Franks who, I am satisfied are the persons named in and who executed the foregoing Certificate of Corporation, and I having first made known to them the contents thereof, they severally acknowledged that they signed, sealed and executed the same as their

voluntary act and deed, for the uses and purposes therein expressed.

HOWARD W. HAYES,  
Master in Chancery of New Jersey.

[ENDORSED.]

" Received and recorded in the Office of the Clerk of the County of Essex this 25th day of Jany. 1896 in Book 11 of Incorporated Bus. Cos. on page 189 &c.

870

J. WRIGHTSON,  
Clerk."

" Filed Jan 27 1896,

HENRY C. KELSEY,  
Secretary of State."

# STATE OF NEW JERSEY

[Insignia]

871

## DEPARTMENT OF STATE.

I, S. D. DICKINSON, Secretary of State of the State of New Jersey, do HEREBY CERTIFY that the foregoing is a true copy of the Certificate of Incorporation of National Phonograph Company, and the endorsements thereon, as the same is taken from and compared with the original filed in my office on the Twenty-seventh day of January, A. D. 1896 and now remaining on file therein.

872

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal, at Trenton, this seventeenth day of April, A. D. 1903.

[SEAL]

S. D. DICKINSON,  
Secretary of State.

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U. S. CIRCUIT COURT,  
NORTHERN DISTRICT OF ILLINOIS,  
NORTHERN DIVISION.

874

NATIONAL PHONOGRAPH CO.  
Complainant,  
vs.  
LAMBERT COMPANY,  
Defendant.

In Equity.  
No. 26,598.

**Complainant's Exhibit Assignment of Patent in Suit. M. P. S., Spl. Exr.**

DEPARTMENT OF THE INTERIOR.

[Insignia]

875

UNITED STATES PATENT OFFICE.

TO ALL PERSONS TO WHOM THESE PRESENTS SHALL COME  
GREETING :

THIS IS TO CERTIFY That the annexed is a true copy from the records of this office of an instrument in writing executed by Thomas A. Edison, December 16, 1902, and recorded in Liber D 66, page 473.

876

Said record has been carefully compared with the original and is a correct transcript of the whole thereof.

IN TESTIMONY WHEREOF, I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this 18th day of April, in the year of our Lord one thousand nine hundred and three and of the Independence of the United States of America the one hundred and twenty-seventh.

[SEAL]

F. I. ALLEN,  
Commissioner of Patents.

877

Liber D 66

Page 473.

WHEREAS, I, Thomas A. Edison, of Llewellyn Park in the County of Essex and State of New Jersey, did obtain Letters Patent of the United States No. 713,209 on the 11th day of November 1902 for a process of duplicating phonograms ;

AND WHEREAS, I am the sole and exclusive owner of said Letters Patent and the invention described therein, and of all rights and privileges thereunder ;

878

AND WHEREAS, National Phonograph Company, a corporation organized and existing under and by virtue of the laws of the State of New Jersey and having its principal place of business at Orange in the County of Essex in said State, is desirous of acquiring said Letters Patent and all rights thereunder ;

NOW THEREFORE, to all whom it may concern, be it known that for and in consideration of the sum of One Dollar, lawful money of the United States, to me in hand paid, the receipt of which is hereby acknowledged, I, the said Thomas A. Edison, have sold, assigned and transferred, and by these presents do sell, assign and transfer, to the said National Phonograph Company, its successors or assigns, my entire right, title and interest in and to the aforesaid Letters Patent No. 713,209, dated November 11, 1902, and the invention described and claimed therein, together with any and all right or rights of action, claims and demands whatsoever, either at law or in equity, for damages or profits or both, which I have or may have for past infringement of said Letters Patent, with full right to the said National Phonograph Company, in its own name, to sue upon and collect the same for its own use and behoof; the same to be held and enjoyed by the said National Phonograph Company, its successors or assigns, to the full end of the term for which said Letters Patent are or may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made.

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881

IN WITNESS WHEREOF, I have hereunto set my hand  
and seal this 16th day of December, 1902.

THOS. A. EDISON.

In the presence of

FREDERICK C. DEVONALD

J. A. BOEHM

STATE OF NEW JERSEY }  
County of Essex } ss. :

882

BE IT REMEMBERED that on this 16th day of December 1902, before me, JOHN F. RANDOLPH, a Notary Public, personally appeared Thomas A. Edison, who I am satisfied is the person named in who executed the within assignment, and I having first made known to him the contents thereof, he acknowledged that he signed, sealed and delivered the same as his voluntary act and deed for the uses and purposes therein specified.

883

JOHN F. RANDOLPH  
Notary Public for New Jersey

[Notarial Seal.]

Recorded December 18th, 1902.

884

**Exhibits—Notice.****UNITED STATES CIRCUIT COURT,**

NORTHERN DISTRICT OF ILLINOIS, NORTHERN DIVISION.

NATIONAL PHONOGRAPH COMPANY,  
Complainant,

vs.

LAMBERT COMPANY,  
Defendant.In Equity, No.  
26,598.  
On Patent No.  
713,209.

886

TAKE NOTICE that on the bill of complaint and the schedules referred to therein, and on the affidavits of John Robert Taylor and George M. Nisbett and the exhibits referred to in said affidavits, copies of which, with the exceptions hereinafter noted, are herewith served upon you, we shall move this Honorable Court or one of the Judges thereof, at the Court Rooms of the Court in the City of Chicago, on the 2nd day of February, 1903, at the opening of the Court on that day or as soon thereafter as counsel can be heard, for a preliminary injunction in accordance with the prayer of the bill of complaint, on claim 17 of patent No. 713,209 in suit, and for such other and further relief as to the Court may seem meet.

887

A copy of the record in the interference of Lambert vs. Edison referred to in the affidavit of John Robert Taylor as "Exhibit E" and "Exhibit F", and the model exhibit referred to in the affidavit of George M. Nisbett as "Exhibit A" may be inspected at the office of the Clerk of the Court, where they have been placed on file with the original affidavits.

888

Dated Chicago, Ill., January 7th, 1903.

ISHAM, LINCOLN & BEALE,  
Solicitors for Complainant.TO THE DEFENDANT, LAMBERT COMPANY,  
No. 12 Sherman St.,  
Chicago, Illinois.



889

**Affidavit of John R. Taylor.**

Affidavit of John Robert Taylor for use in a suit about to be brought in the United States Circuit Court for the Northern District of Illinois, Northern Division, by National Phonograph Company against Lambert Company, on patent No. 713,209.

890

STATE OF NEW YORK, }  
County of New York, } ss. :

JOHN ROBERT TAYLOR, being duly sworn, deposes and says as follows :—

891

I am an attorney-at-law, reside in the Borough of Brooklyn, City of New York, State of New York, and am employed by the firm of Dyer, Edmonds & Dyer, attorneys-at-law, No. 31 Nassau Street, Borough of Manhattan, in said City. Among my other duties in said office, I have charge of the records of the office, including records in suits in the courts, interferences in the Patent Office, and applications for patents.

892

I am familiar with the history of the prosecution in the Patent Office of the application for patent upon which patent No. 713,209 was granted November 11, 1902, to Thomas A. Edison for Process of Duplicating Phonograms, such history being shown by the records under my charge. I am also acquainted with the history of the prosecution of the application upon which patent No. 645,920 was granted March 20th, 1900, upon the invention of Thomas B. Lambert for Method of Reproducing Phonograph Records, a certified copy of the file-wrapper and contents of such application having been procured in connection with the interference between Lambert and Edison which will be hereinafter referred to, such certified copy being a part of the records under my charge.

The first claim of the Lambert patent No. 645,920 and the seventeenth claim of the Edison patent No. 713,209, which are identical, were suggested by the

893

Patent Office Examiner in both the Lambert and Edison applications by letters dated January 18, 1900. As appears by the Examiner's letters in the two applications, the suggestion was made so as to distinguish the invention as claimed from the prior art as shown particularly by English patents to Lioret No. 23,366 of 1893 and Young No. 1,478 of 1894. It was also stated in the same letters that an interference would probably be declared with other pending applications. In the Lambert application this claim was inserted by an amendment dated January 22, 1900, and received by the Patent Office January 24, 1900. In the Edison case an amendment was drawn inserting this claim on January 19, 1900, and was forwarded to the Patent Office by mail in the usual course on the same day. The claim was numbered 11 at the time of its insertion, but was renumbered 17 before the patent was issued.

894

On March 21, 1900, a letter was forwarded to the Patent Office in the Edison application, containing the following statement:—

895

"To-day we note in the Gazette the grant of a patent No. 645,920 to Lambert for Method of Reproducing Phonograph Records, dated March 20, 1900. The first claim of this patent is, word for word, identical with the eleventh claim introduced in this application by amendment of January 19, 1900, in response to the Examiner's letter of January 18, 1900. We presume the Lambert patent issued inadvertently, and request an interference therewith."

896

On April 13, 1900, the Patent Office replied that—

"The amendment said to have been made in this case on January 19 has not been received at the Office."

On April 17, 1900, an amendment was forwarded to:



897

the Patent Office inserting the suggested claim and closing with the following statement:—

898

“Regarding the failure of the Office to receive our amendment of January 19th, 1900, we desire to say that we have been assured by our mailing clerk that the amendment in question was properly deposited in the mails, and we presume that the amendment has miscarried in the Patent Office and will be possibly found in some other examining division.

The interference referred to in our letter of the 21st ult. is respectfully requested.”

899

900

On May 16th, 1900, the Patent Office declared an interference between the Edison application and the Lambert patent, a copy of said declaration of interference being attached hereto and marked “Exhibit B.” Thereupon preliminary statements were filed by both Edison and Lambert, copies of said statements being found in the printed record in the interference case, which record will be hereinafter referred to. Thereupon and on June 9, 1900, the Patent Office set the times for the taking of testimony and for the hearing in said interference case, making the said Edison the senior party to said interference by reason of the earlier filing date of his application, and throwing the burden of proof upon Lambert. Thereupon the attorney for Lambert moved to dissolve the interference on the grounds which appear in the decision of the Primary Examiner hereinafter referred to, and also to shift the burden of proof in the interference from Lambert to Edison. After a hearing on said motion, the Primary Examiner, on August 22nd, 1900, decided said motion in favor of Edison, a copy of said decision being annexed hereto and marked “Exhibit C.” Lambert’s attorney then took an appeal from said decision of the Primary Examiner to the Commissioner of Patents in person. After a hearing upon said appeal, the Commissioner of Patents affirmed the de-

901

cision of the Examiner, as appears by a copy of said decision of the Commissioner of Patents dated November 15, 1900, hereto annexed and marked "Exhibit D." Thereafter, and in February, 1901, testimony was taken in said interference on behalf of Lambert, this being followed at once by testimony taken in the same month on behalf of Edison, and in March, 1901, testimony in rebuttal was taken on behalf of Lambert. The testimony so taken was filed in the Patent Office and was printed under the practice in interference cases. Printed copies of the records of Edison and Lambert, respectively, in said interference are submitted herewith, being marked respectively "Exhibit E" and "Exhibit F."

902

Thereafter a hearing was had on the merits of the interference before the Examiner of Interferences, who on May 28, 1901, rendered a decision in favor of Edison, a copy of which decision is attached to the bill of complaint in this action and marked "Schedule A." An appeal was taken by Lambert from the decision of the Examiner of Interferences to the Board of Examiners-in-Chief, which appeal was argued and resulted in a decision by the Examiners-in-Chief, dated August 13, 1901, affirming the Examiner of Interferences, a copy of said decision of the Examiners-in-Chief being also attached to the bill of complaint herein and marked "Schedule B."

903

Thereafter Lambert took an appeal from the decision of the Examiners-in-Chief to the Commissioner of Patents in person, which appeal was argued before the Assistant Commissioner of Patents and was decided by him December 10, 1901, a copy of said decision being attached to the bill of complaint herein and marked "Schedule C." No appeal was taken by Lambert from the decision of the Commissioner of Patents to the Court of Appeals of the District of Columbia.

904

The prosecution of the Edison application was thereupon continued. On January 31st, 1902, the Patent Office suspended Official action in the case until February 12, 1902, in view of further interference



905

proceedings. On February 14th, 1902, no Official action having been taken, the attention of the Patent Office was called to the case. On March 8th, 1902, the Patent Office resumed the proceedings. On May 10th, 1902, after further proceedings, the Patent Office declared the case to be allowable but suspended action for fifteen days in view of a probable interference, requesting that the case be called up for action at the end of that time. On May 21st, 1902, the case was

906

called up for action and resulted in the declaration on June 24th, 1902, of three new interferences with applications of Eldridge R. Johnson and Maurice Joyce. These interferences were decided in favor of Edison on September 6th and October 13th, 1902, whereupon the Edison application was allowed October 20th, 1902, and the final fee being paid, the patent was issued in due course.

907

In addition to the interferences which have been already recited, an interference was declared with an application of Frank L. Capps on July 18th, 1900, which was decided in Edison's favor April 23rd, 1901, and hence was pending concurrently with the Lambert interference.

908

I have examined the phonograph record referred to as "Exhibit A" in the affidavit of George M. Nisbett in this case, dated December 23rd, 1902. That record bears the following imprint:—"Pat'd. March 20, 1900." An examination of the Patent Office Official Gazette shows that the patent there referred to is patent No. 645,920, granted March 20, 1900, which was in interference with the Edison application upon which patent No. 713,209 was granted November 11, 1902.

In the two suits pending in this Court brought by the Edison Phonograph Company and the National Phonograph Company against the Lambert Company and Thomas B. Lambert, the Lambert Company makes the following allegation in its answer in each case, which answers were filed April 1st, 1901:—

"4. These respondents \* \* \* aver and insist that all their operations in reference t

909

the manufacture, sale, or use of phonogram blanks have been conducted in good faith, as a matter of right, and under Letters Patent of the United States granted to Thomas B. Lambert, Nos. 645,920 and 664,223, dated March 20th and December 18th, 1900, respectively \* \* \* .

5. These respondents admit that they are engaged—in a corporate capacity only—in the manufacture and sale of phonogram blanks at Chicago, in the County of Cook and State of Illinois, and that such articles are manufactured, used and sold by said Company under two Letters Patent of the United States granted to Thomas B. Lambert—of which it is the assignee of the entire right thereunder—the 20th day of March and 18th day of December, A. D. 1900, Nos. 645,920 and 664,223, respectively \* \* \* .”

910

The complainants in said suits are represented by Dyer, Edmonds & Dyer, and the records in said cause are under my charge.

911

I attach hereto, marked respectively “Exhibit G” and “Exhibit H,” printed Patent Office copies of the specifications and drawings of the Edison patent No. 713,209 and the Lambert patent No. 645,920.

JOHN ROBERT TAYLOR.

Subscribed and sworn to before me this 31st day of December, 1902.

S. O. EDMONDS,

912

[SEAL.]

Notary Public,

N. Y. County.

\* aver and  
reference t



913

**Exhibit B.—Taylor Affidavit.**

U. S. Patent Office  
 May 16 1900  
 Mailed  
 May 9 1900  
 Div. 23

914

## DEPARTMENT OF THE INTERIOR.

UNITED STATES PATENT OFFICE,

J. H. D.

WASHINGTON, D. C., May 16, 1900.

No. 20,534.

THOMAS A. EDISON,

Care Dyer, Edmonds &amp; Dyer,

No. 31 Nassau Street, New York, N. Y.

915

Please find below a copy of a communication from  
 the Examiner concerning your application for Processes  
 of Duplicating Phonograms, filed March 5, 1898, serial  
 number 672,650.

Very respectfully,

C. H. DUELL,  
 Commissioner of Patents.

Room No. 219

All communications should be addressed to

916

"The Commissioner of Patents  
 Washington, D. C."

Your case, above referred to, is adjudged to inter-  
 fere with others, hereafter specified, and the question  
 of priority will be determined in conformity with the  
 Rules.

The statement demanded by Rule 110 must be sealed  
 up and filed on or before the 8th day of June, 1900,  
 with the subject of the invention, and name of party  
 filing it, indorsed on the envelope. The subject-matter  
 involved in the interference is—

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Exhibit B—Taylor Affidavit.

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The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and then outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement.

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The above issue is your claim 11 and is substantially claim 1 of an application of Thomas B. Lambert, of Chicago, Ill., patented March 20, 1900, Pat. No. 645,920; assor of 3/5 to Brian F. Philpot and Joseph Powell of Chicago, Ill., whose attys., are Banning and Banning and Sheridan, Marquette Building, Chicago, Ill.

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**Exhibit C.—Taylor Affidavit.**

Intf. No. 20,534.

Mailed

Aug 22 1900

U. S. Patent Office.

(2-076)

Room No. 219

- 922 All communications should be addressed to  
 "The Commissioner of Patents,  
 Washington, D. C."

**DEPARTMENT OF THE INTERIOR.****UNITED STATES PATENT OFFICE.**

J. H. D.

WASHINGTON, D. C., Aug. 22, 1900.

- 923 In Re Interference } Before the Primary Examiner,  
 Lambert *vs* Edison } Division 23.  
 Motion to dissolve.

THOMAS A. EDISON,

Care Dyer, Edmonds &amp; Dyer,

No. 31 Nassau Street, New York, N. Y.

Please find below a communication from the Examiner in charge of Division 23 in regard to the above-cited case.

924

Very respectfully,

C. H. DUELL,

Commissioner of Patents.

**MOTION TO DISSOLVE.**

This is a motion to dissolve the above entitled interference:

(a) Because there is no interference in fact:

(b) Because there has been such irregularity in declaring the same as will preclude a proper determination of the question of priority;

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(c) Because the said Edison has no right to make the claim of his application which is involved in the interference ; and

(d) Because the said Thomas A. Edison should be made the junior party herein, on the ground that for the purposes of this interference—as per Rule 116—his application should date from the date on which his completed application clearly illustrated and described the invention which is the subject matter of the count in issue, viz., March 20, 1900.

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The issue is in the following terms :

The method of producing record cylinders for phonographs which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and then outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement.

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The process recited in this claim consists of several steps, and Lambert's contention is that Edison's specification does not disclose certain of these steps and that certain others were only introduced into the case late in its history and were not disclosed in the application as originally filed.

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It is conceded that both Lambert's patent and Edison's application disclose the same method of making the original record ; but Lambert contends that Edison does not disclose the next step, or the next two steps, viz., "rendering the surface of the wax cylinder electrically conductive and electrolytically depositing metal thereon forming a matrix."

As explained on page 1 of his patent, Lambert renders the surface of his wax cylinder electrically con-

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Intf. No. 20,534.  
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C. H. DUELL,  
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ductive by providing it with a coating of carbon or other electric conducting material, and then forms his matrix of a shell of copper electrolytically deposited on this coating. Edison describes several ways of making his matrix, one of which is identical with Lambert's. His preferred method, however, is by giving the wax cylinder a preliminary metallic coating by a process which he calls vacuous deposition and a further

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covering of metal by electroplating a metal upon the vacuous deposit in the usual manner of electroplating until a shell of the desired thickness is secured. He says that he prefers this process because the vacuous deposit follows accurately all the indentations of the record, however minute, and forms a more perfect copy than can be secured by the use of graphite. Edison should not be permitted to make the claim of the issue in this application unless such claim can be properly based on this preferred method, as he has several claims in the case drawn specifically to the use of the process of vacuous deposit.

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The process of vacuous deposition is old, having been described in a patent granted to Edison, Sept. 18, 1894, No. 526,147. The use of this process for forming a matrix for duplicating phonograph records, is also old, as shown in Edison's patent No. 484,582, dated October 18, 1892.

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In patent No. 586,147, it is said that the vacuous deposit may be made very thin and in the affidavit of Charles N. Wurth, filed in Edison's present application Sept. 2, 1898, it is said that in the process of this application as practiced in Edison's laboratory the vacuous deposit is an infinitesimally thin coating of metal, on which a heavier coating of metal is formed by electroplating. This thin coating of metal formed by vacuous deposit in Edison's process seems to be the equivalent of Lambert's thin coating of carbon or other electric conducting material. Neither the carbon nor the vacuous deposit would be necessary if the wax were a conductor of electricity. It is held, therefore, that both the pat-

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Edison, Sept. 18,  
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ent and the application disclose a process, part of  
which consists in "rendering the surface of the wax  
cylinder electrically conductive, and electrolytically  
depositing metal thereon forming a matrix."

Lambert's next contention is that Edison's specifica-  
tion does not disclose the use of a cylinder of softened  
material, but, on the contrary, constantly refers to his  
material as hard. Hard and soft are purely relative  
terms and it is necessary to examine the context in  
order to determine what they mean. In Lambert's  
specification the word "soft" evidently means that  
the material is in a condition softer than normal, a  
condition which he secures by using his cellulose or  
vulcanized rubber "either in a raw or partially cured  
state or previously softened by some solution." In  
Edison's specification the word "hard" evidently means  
harder than the ordinary wax record material—"a  
harder material than can be practically or satisfactorily  
engraved or indented by the phonograph."

Edison mentions several materials which may be  
used in his process, but, in an amendment filed May  
10, 1900, has introduced a claim drawn specifically to  
the use of celluloid, so that, under the Office practice,  
he cannot be allowed in this case a claim that would  
not be readable on a process in which this material  
is used. By the preferred form of Edison's process,  
then, a cylinder of celluloid is introduced into the mat-  
rix and the two together heated to such a point—ac-  
cording to Wurth's affidavit, about 115°—as to cause the  
blank to engage the matrix, when a tapered mandrel  
is forced out into the cylinder, pressing it more tightly  
against the matrix. It is a well known property of cel-  
luloid that at very low temperatures it is comparatively  
hard and more or less brittle, and that, as the tem-  
perature is increased, it gradually softens, reaching a  
state of plasticity somewhere below the boiling point  
of water. While, therefore, Edison may not heat his  
celluloid blank sufficiently to render it plastic, yet the  
heating would inevitably soften it more or less from  
the very nature of the material employed.

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As originally filed, neither of the specifications involved in this interference contained any reference to the thickness of the record material. This feature was first introduced into both for the same reason, viz., to avoid the English patent to Young, which describes a cylinder of very thin celluloid; it was supported in both cases by supplemental oath; and it was admissible in both cases for the same reason, viz., that both showed cylinders of thick material in the drawings as originally filed. The thickness of the record material was first mentioned in the Lambert case in an amendment of Nov. 22, 1899, and in the Edison case in an amendment of March 21, 1900. The introduction of this feature did not change the original invention in either case; but both applicants, in the progress of the examination of their cases, found it advisable to emphasize a feature at first supposed to be either altogether unimportant or else such as would be taken for granted.

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The motion to shift the burden of proof comes clearly within the decision of the Acting Commissioner in the case of Walsh vs. Hallbauer, 88 O. G., 2409, and is denied.

For the reasons given above, the motion to dissolve is overruled.

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In so far as this decision relates to the question of Edison's right to make the claim of the issue, there is no appeal. In so far as it relates to the question of irregularity in declaring the interference or to interference in fact, the limit of appeal will expire Sept. 21, 1900.

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**Exhibit D—Taylor Affidavit.**

## DEPARTMENT OF THE INTERIOR,

## UNITED STATES PATENT OFFICE.

WASHINGTON, D. C., Nov. 15, 1900.

In the matter of the }  
 Interference of } Intf. No. 20,534.  
 Lambert vs. Edison. } Appeal on Motion.

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SIR :

You are hereby informed that the decision of the Commissioner on the above appeal is as follows :

"The vital question involved in this appeal is whether the amendment made to the Edison application under date of April 19, 1900, was warranted or whether by said amendment the application was made to include a different invention from that originally disclosed.

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After a careful examination of the record the question must be answered in the negative. The basis for the amendment is found in the application as originally filed. Only two of the steps of the method of the issue in question disclose any degree of novelty, and as to one of these steps—the last—no question can be raised as to its disclosure in the Edison specification.

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In short, there remains to decide simply whether Edison disclosed prior to April 19, 1900 the intended use of a cylinder of *softened* material. As the Examiner correctly says, "hard and soft are purely relative terms and it is necessary to examine the context in order to determine what they mean." I agree with him that when the specifications are examined the conclusion that naturally follows is, that the language warrants the deduction



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that both parties originally disclosed the same patentable method. The Examiner properly made Edison the senior party. It follows that the decision of the Examiner appealed from should be, and it is, affirmed.

C. H. DUELL,  
Commissioner.

November 14, 1900.

By direction of the Commissioner.

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Very respectfully,

C. M. IRELAN,  
Acting Chief Clerk.  
per G.

THOS. A. EDISON,  
C/o Dyer, Edmonds & Dyer,  
31 Nassau Street,  
New York, N. Y.

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H. DUELL,  
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**Exhibit E—Edison's Interference Record—  
Taylor Affidavit.**

IN THE UNITED STATES PATENT OFFICE.

<p>THOMAS B. LAMBERT</p> <p>vs.</p> <p>THOMAS A. EDISON.</p>	<p>Interference No. 20,534. Process of Duplica- ting Phonograms.</p>	950
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**Preliminary Statement of Thomas A.  
Edison.**

STATE OF NEW JERSEY, }  
County of Essex, } ss.:

THOMAS A. EDISON, being duly sworn, doth depose 951  
and say that he is a party to the interference declared  
by the Commissioner of Patents on May 16, 1900, No.  
20,534, between his application for a patent for Pro-  
cesses of Duplicating Phonograms, filed March 5, 1898,  
Serial No. 672,650, and the patent to Thomas B. Lam-  
bert, dated March 20, 1900, No. 645,920, the applica-  
tion for which patent was filed August 14, 1899. That  
he conceived, disclosed to others, reduced to actual  
practice and made drawings of an apparatus intended  
for the carrying out of the method or process defined 952  
by the issue of said interference, in the month of Octo-  
ber, 1888, and that since that time he has continu-  
ously practiced the said method or process at his  
laboratory at Orange, New Jersey, and has made a  
great number of duplicate phonograph records by said  
process.

THOMAS A. EDISON.

Subscribed and sworn to be- }  
fore me this 22nd day of }  
May, 1900.

J. F. RANDOLPH,  
[SEAL] Notary Public for New Jersey.



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**Issue.**

The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and then outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement.

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IN THE UNITED STATES PATENT OFFICE.

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THOMAS B. LAMBERT

vs.

THOMAS A. EDISON.

Interference  
No. 20,534.  
Record Cylinders  
for Phonographs  
and Method of  
Producing the  
Same.

To THOMAS F. SHERIDAN, Esq.,  
Attorney for Lambert, 531 Marquette Building,  
Chicago, Illinois :

956

SIR—You are hereby notified that on Thursday, February 21, 1901, at the Edison Laboratory, Orange, New Jersey, at eleven o'clock in the forenoon, before Alphons Westee, Esq., a Notary Public, or other competent officer, we shall proceed to take the testimony of the following witnesses in behalf of Edison :

Thomas A. Edison, of Orange, New Jersey.  
John F. Randolph, of Orange, New Jersey.  
Charles Wurth, of Orange, New Jersey.  
Jonas Walter Aylsworth, of Orange, New Jersey.  
Walter H. Miller, of Orange, New Jersey.  
and possibly others.

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The examination will continue from day to day until completed. You are invited to attend and cross-examine.

New York, February 15, 1901.

Respectfully,  
DYER, EDMONDS & DYER,  
Attorneys for Edison.

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Due and timely service of the above notice acknowledged this 18th day of February, 1901.

THOMAS F. SHERIDAN,  
Attorney for Lambert.

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## UNITED STATES PATENT OFFICE.

THOMAS B. LAMBERT

vs.

THOMAS A. EDISON.

Interference No.  
20,534. Record  
Cylinders for  
Phonographs and  
Methods of Pro-  
ducing the Same.

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ORANGE, NEW JERSEY, February 21st, 1901.

Testimony on behalf of Edison, taken this 21st day of February, 1901, beginning at 11:30 A. M., before ALPHONS WESTEE, a notary public, at the laboratory of Thomas A. Edison, Orange, New Jersey, pursuant to the annexed notice.

963

Present—FRANK L. DYER, Esq., for Edison ; THOMAS F. SHERIDAN, Esq., for Lambert.

**Thomas A. Edison.**

THOMAS A. EDISON, a witness produced on his own behalf, having been duly sworn, in answer to questions proposed by MR. DYER, deposes and says as follows :

1 Q. What is your name, age, residence and occupation ?

964 A. Thomas A. Edison ; age, 54 ; residence, Llewellyn Park, Orange, New Jersey ; inventor.

2 Q. You are the same Thomas A. Edison who filed the application involved in this interference, are you not ?

A. I am.

3 Q. The method involved in this interference is thus defined by the Patent Office :

" The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically

ord.

OFFICE.

Interference No.  
20,534. Record  
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conductive, and electrolytically depositing metal thereon, forming a matrix, and then outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement."

When did you first conceive of this method?

A. About October, 1888.

4 Q. How do you fix this date?

A. By a caveat which I filed in the Patent Office October 26th, 1888.

Certified copy of so much of the caveat in question as relates to the present process is offered in evidence, and marked "Edison Exhibit Extract from Edison Caveat," and a copy of the complete caveat is offered for purposes of cross-examination.

5 Q. After you conceived the invention of this process, what did you do with it?

A. I went to work at it to put it in a commercial shape, turning it over to an assistant to put it into commercial shape.

6 Q. To whom did you turn the matter over?

A. To a man by the name of Schulzberg.

7 Q. Is Schulzberg living now?

A. No, sir; he is dead.

8 Q. When did Dr. Schulzberg first carry out the process under your direction?

A. In October, 1888.

9 Q. How did Dr. Schulzberg make the molds or matrices?

A. By an electro-vacuous deposition of the vapor of gold on the surface of a phonographic record cylinder, and then placing the same in an electrolytic deposition bath of copper, and plating a thick coating of copper over this cylinder, and finally dissolving or melting out the original waxlike record. This shell was

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backed up by being turned and put into a stronger shell, and into this was placed a smooth blank cylinder of the ordinary commercial thickness, at a low temperature, and then by heat and pressure the same was expanded so as to fill the indentations composing the record on the matrix. Afterwards the whole was chilled down to a low temperature, the waxlike material contracting in a greater ratio than the matrix permitted it to free itself from the same, and was taken out longitudinally.

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10 Q. I wish you would examine the several pieces of apparatus on the table in front of you and point out one of the original molds made in October, 1888, by Dr. Schulzberg?

A. The one I now hand you is one of the original molds, as I remember it, as made by Dr. Schulzberg under my direction.

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The mold referred to by the witness is introduced in evidence and marked "Edison Exhibit Original Schulzberg Mold."

11 Q. Will you also please point out, if possible, one of the original duplicate copies made in October, 1888, by Dr. Schulzberg?

A. The one I hand you was made by Dr. Schulzberg from a matrix in 1888, by the expansion process in controversy.

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12 Q. How do you identify this so positively?

A. By the nature of the material of the cylinder. A short while after that was made we adopted the other material for making cylinders.

The duplicate copy referred to is introduced in evidence and marked "Edison Exhibit Original Duplicate Copy."

13 Q. After Dr. Schulzberg practically carried out the process in October, 1888, what was then done with it?

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A. One of my assistants, Mr. Charles Wurth, was put at work also with Schulzberg on working up the methods for a commercial production of the duplicates.

14 Q. When did Mr. Wurth start in on this work?

A. In the spring of 1889.

15 Q. Has he been practically, continuously working on the process from that time until the present time?

A. Yes, sir; nearly the whole of his time.

16 Q. And I presume he has made a large number of these molds and has produced copies therefrom by an expanding process, as you describe above?

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A. Yes, sir; he has produced a great many matrices, and has produced a great many copies from the matrices by expansion, which have been used commercially.

17 Q. Why was it necessary or desirable for Mr. Wurth to make such a large number of these matrices and copies during this time?

A. To get it so that they could be manufactured cheaply in large quantities and so that the matrices would be very perfect and without a flaw. On account of the expense of making these matrices, and the idea which I had in my mind that they would be permanent, and the large investment required to carry a large stock of these, it was essential that the records should be very perfect. The process necessary to make a perfect matrix and the reproduction of duplicates from these matrices commercially and cheaply and perfectly is a matter of extreme difficulty to preserve the exact quality and prevent any slight irregularities and extraneous noises due to imperfections.

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18 Q. But so far as the process is concerned, it is just the same now in a broad sense that it was when Dr. Schulzberg carried it out in 1888?

A. Just the same.

19 Q. And Mr. Wurth's work from 1889 up to 1898, when you filed your application, was directed only towards the improvement of small details to make it commercial?

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A. That is correct ; commercial and perfect.

20 Q. How perfect were the duplicate copies made by this process under your direction as early, say, as 1891 ?

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A. They were perfect as far as quality was concerned, but there was some scratching of the cylinder which was objectionable, and they were not quite as loud as the matrix should have given them, and the expansion of the material in heating was not exactly as we desired it.

21 Q. You filed your application for a patent in March, 1898 ; did you consider the process commercially perfected at that time ?

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A. The process of expanding the cylinder in the matrix and withdrawing it was perfected long before that, but the process as a whole was perfected by that time as a commercial proposition. By this I mean that the process was so far perfected that I was able to make absolutely perfect duplicate copies at a price that would make the process worth carrying out in competition with other methods. So far as the making of the mold and the expanding of a blank within the mold and the withdrawing of the blank longitudinally are concerned, they were just as perfect in October, 1888, as they are now.

22 Q. What are the duplicate copies made by this process at the present time used for ?

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A. They are used as masters in the mechanical duplicating process, because they are so perfect that they are indistinguishable from the original master.

23 Q. How often did you consult with Mr. Wurth during his experiments ?

A. Several times a week. Whenever he would meet with a difficulty, he would come to me, and I would make suggestions which he would carry out.

24 Q. So that you are able to say of your own knowledge that Mr. Wurth had been working practically continuously on this identical process from early in 1889 up to the time you filed your application in March, 1898.

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A. Yes, sir; practically continuously. I believe my books will show that.

## CROSS-EXAMINATION BY MR. SHERIDAN:

25 x-Q. Did you ever make any celluloid records, Mr. Edison?

A. I have lately.

26 x-Q. When did you first make a celluloid record?

A. I don't remember; I think, perhaps, about a year or a year and a half ago.

27 x-Q. Have you tried any of them?

A. Yes, sir.

28 x-Q. With what success?

A. Worked fairly well; a little scratchy.

29 x-Q. You didn't make any celluloid records, though, as early as 1889 or 1890?

A. No, I don't remember that I did.

30 x-Q. All the records you made at that early date, or prior to 1897, were records that were made of a wax-like substance; is that true?

A. I think they were, but still I am not sure, for we tried using a number of materials, but I don't remember using celluloid at that early date.

31 x-Q. Now, you speak of making an electro-deposit in a vacuum on the waxlike master. That practically made the matrix, did it not?

A. That acted as a base whereby we could make the matrix.

32 x-Q. The electro-plating deposit was a mere backing?

A. It was a backing, because the vacuum deposit was excessively thin, and intended to be so.

33 x-Q. In expanding these phonograms to get the impression from the matrix, you didn't do any preliminary softening, did you?

A. Yes, sir.

34 x-Q. How did you soften them?

A. By heating.

35 x-Q. Did you heat them to soften them?

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A. Yes, sir ; heated the matrix, mold and all.

36 x-Q. That is, to soften the record ?

A. Yes, sir.

37 x-Q. Did you read the affidavit made by Mr. Wurth in this case while it was pending in the Office ?

A. No, sir ; I don't remember seeing it.

38 x-Q. In this affidavit made by Mr. Wurth he says that this heating was done for the purpose of expanding the record only.

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A. Well, we used the expansive force of heat to produce pressure, as well as using a mandrel, and also used the heat for the purpose of softening the brittle material so that it would take the impression ; flow in a viscous manner.

39 x-Q. There was no preliminary softening, though, before the phonogram was placed in engagement with the mold ?

A. No, sir.

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40 x-Q. Mr. Wurth further said in that affidavit that this heating does not in any way affect the brittleness of the blank, nor does it make it plastic ; is that true ?

A. No, sir.

41 x-Q. It is not true ?

A. No, sir ; that is his theory.

42 x-Q. There is on file in this case, Mr. Edison, a statement signed by you that you read this affidavit of Mr. Wurth and agreed with him ?

988

A. That may be true. I probably just glanced over it as a matter of routine of business, as I have thousands of papers to sign ; probably didn't pay much attention to it—supposed that Mr. Wurth would state the case correctly. He is only an assistant of mine and knows nothing about the theory of the thing ; merely carries out my directions.

43 x-Q. Well, didn't you know, Mr. Edison, at the time he was making this affidavit in this case that it was for the purpose of overcoming the Lioret and the Young references ?

A. I never heard of those people.

989

44 x-Q. Then you never saw those references?

A. No, sir; I don't attend to the patent business; that is done by my attorney.

45 x-Q. Were you ever concerned in any litigation on this subject with the American Graphophone Company?

Objected to as irrelevant.

990

A. No, sir; I don't remember ever being.

46 x-Q. You knew, of course, all the time between 1888 and 1898 of the value that this process would have in the arts, did you not?

A. I knew in the last two or three years of its value, but in 1888 the phonograph was not commercial, and the company which attempted to commercialize it went into bankruptcy. It was not until seven years later that the public became a buyer of phonographs, but I always believed that they ultimately would appreciate the invention, and, therefore, I worked continuously on this process, with a view that some day it would be of great value, when the public did take hold, which they did in the last two or three years.

991

47 x-Q. You took out a great number of patents between 1888 and 1898, did you not?

A. Yes, sir.

48 x-Q. You don't know just how many you took out in that period of time, do you?

A. No, sir.

49 x-Q. It is safe to say, however, that you took out a couple of hundred, two or three hundred?

992

A. Well, I should say I have taken out a hundred.

50 x-Q. I have a list here of forty-one patents that were taken out by you between March 11, 1890, and January 12, 1897, relating to just this particular art. Do you think that is correct?

A. I suppose it is correct. I see no reason why it is not.

51 x-Q. During all that time, your income was suffi-



993

cient to take out additional patents if you so chose, was it not?

A. Yes, sir.

52 x-Q. Did you ever use plumbago as an electrical conducting material on the wax record?

A. Yes, sir.

53 x-Q. And then electroplated directly on to the plumbago?

A. Yes, sir.

994

54 x-Q. When did you do that first?

A. I think that was the first thing I tried; away back in the early phonograph days.

55 x-Q. Then you abandoned that and took up the electro-vacuous deposit?

A. Yes. The plumbago didn't give a smooth record, as I desired.

56 x-Q. About what temperature did you raise the phonogram to when you were expanding it in the mold?

995

A. I don't remember now, but I can get that from my assistant who kept the records.

57 x-Q. How soft do you suppose those wax phonograms were when you were heating them?

A. Soft enough to flow viscously and fill the indentations on the matrix, or the record on the matrix, under pressure.

RE-DIRECT EXAMINATION BY MR. DYER:

996

58 Re-d. Q. How thick is the preliminary electrodeposit which you apply to the original record?

A. Well, it is very hard to say, but I should make a guess that it was about  $\frac{1}{100000}$  of an inch thick, as blue light can be seen through the gold.

59 Re-d. Q. And I understand that that vacuous deposit is used only as a conducting coating for the coating for the electrolytic deposit?

Question objected to as leading.

A. Yes, sir.

997

60 Re-d. Q. About how shallow is a phonographic record groove?

A. A thousandth of an inch will turn off the loudest record, so that nothing can be heard after the thousandth of an inch is taken off.

61 Re-d. Q. I understand you to mean that a phonographic record is no deeper than a thousandth of an inch, and possibly less?

A. It is generally less; I refer now to the loudest.

998

62 Re-d. Q. When you introduced the cylindrical blanks into the matrix, how close a fit did you secure between them?

A. Before expanding, do you mean?

63 Re-d. Q. Before expanding.

A. We try to get it as close as possible without scratching the surface in putting it in.

64 Re-d. Q. So that in order to take an impression the blank requires to expand only to a very slight extent?

999

A. Very slight, yes.

65 Re-d. Q. When you say that the blanks are softened so as to flow viscously, do you mean to say that their surface flows or that the blank as a whole flows?

A. The blank as a whole.

RE-CROSS-EXAMINATION BY MR. SHERIDAN:

66 Re-x-Q. When was Mr. Lambert's claim now the issue in interference first called to your attention; do you recollect?

1000

A. I don't remember ever seeing it.

67 Re-x-Q. Then the claim was put into your application, after the Lambert patent was granted, without your knowledge?

A. I don't remember it.

Adjourned until 2 P. M.



1001

Resumed after lunch.

RE-DIRECT EXAMINATION BY MR. DYER:

68 Re-d. Q. In your application, Mr. Edison, you state that it is possible to secure duplicate copies without the use of a mandrel, by introducing a cylindrical blank in the mold, and allowing it to expand by heat alone. Did you ever carry such a process out?

1002

A. Yes, sir.

69 Re-d. Q. If such a process were carried out, how plastic would the blank be to permit it to retain its body during the act of engaging the mold?

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A. Well, it is a question of degree. If it was putty plastic, it wouldn't give sufficient pressure; if it was plastic like ice, it would be stiff and still be able to have enough plasticity to flow into the record, which is only, perhaps, a thousandth of an inch. The cylinders we have that were used, while they are brittle and can be broken at 100 degrees; still, if submitted to a bending action, which is not sudden, they will distort and bend without breaking, but break easily with a blow, like glass. Their viscosity is increased by heat, like all other materials.

Signature waived by consent.

**John F. Randolph.**

1004

It is hereby stipulated and agreed, by and between counsel for the respective parties to the above-entitled interference, that John F. Randolph, if called as a witness on behalf of Edison, would testify to the following effect:

That he is a bookkeeper at the Edison Laboratory, having charge of the disbursement of all funds therefrom, together with the keeping of books of expenditure and of time on experimental work; that the statement which is here-

1005

with introduced in evidence and marked "Edison Exhibit Schedule of Work Done on Process," offers a tabulated history of all work in connection with the process in controversy, indicating the dates on which work was done, the man by whom the work was done, the character of the work, the time spent on each job, and the payments made therefor; that the books of the Edison Laboratory also show that up to March, 1898, when the Edison application was filed, \$29,560.97 were spent on laboratory work on the commercial development of the process and for the manufacture of molds from which duplicate copies were made, which were used as masters for mechanical duplicating.

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**Charles Wurth.**

1007

CHARLES WURTH, a witness produced on behalf of Edison, having been first duly sworn, deposes and says, in answer to questions by Mr. Dyer, as follows:

1 Q. What is your name, age, residence and occupation?

A. Charles Wurth; age, 60; residence, Orange, New Jersey; experimentalist in the Edison Laboratory.

2 Q. When did you enter the Laboratory in this capacity?

1008

A. In November, 1888.

3 Q. Have you ever had anything to do in the Laboratory with work on duplicating phonograph records?

A. That was the greatest part of my work since I have been here.

4 Q. When did you first actively take up work on duplicating phonographic records?

A. That was in the winter from 1888 to 1889.

5 Q. Under whose direction did you do this work?



1009

A. Professor Schulzberg had charge of it then.

6 Q. Did Mr. Edison have anything to do with it?

A. I guess he did, because he came to look after it and gave suggestions.

7 Q. Did you ever do any of this work independent of Dr. Schulzberg?

A. Well, after Dr. Schulzberg left it was all in my sole charge.

1010

8 Q. When did Dr. Schulzberg leave the laboratory?

A. It must be in 1891—between 1891 and 1892—1891, I guess.

9 Q. Before Dr. Schulzberg left the laboratory, had you, for yourself, made copies of phonographic records?

A. Before he left I made some independently of his work.

10 Q. Please describe the process which you carried out in the making of those copies?

1011

A. I helped make the masters, or we got them from the man who had charge of taking the original records on wax cylinders, and then we put them in a vacuum chamber, a glass globe which was exhausted afterwards, and anodes of different metals; we used platinum and silver and gold to deposit a film of metal on the outside of the master or original record; and after that we connected that to an electrical conductor or wire that we attached to the ends of the original as plated and put them in a copper solution, solution of

1012

sulphate of copper, and applied electric current to make a deposit on the plated master. After that we took that master out again; first we boiled it out, and afterward, to save the master, we shrank it by cold out of the copper shell which was thus obtained, so that the copper shell was the mold then that carried the record on the inside. After the matrix was made and duly trimmed up on both ends, we took a blank cylinder of the same wax, the same material, and shaved it down to a certain size, so that we could cool it and insert it into the mold; sometimes I made it

1013

within .002 of an inch (first I made them .002 of an inch larger than the mold is on the inside) and cooled it—put it in the ice-box and let it cool down, so that it would shrink small enough so as to allow it to go into the mold, the matrix. After that we clamped the whole matrix between two end rings to hold the blank and mold in place. After that we took a hollow core of brass and heated that with water, let hot water run through, and when it had a certain temperature I put the blanks in the mold right over the core and let the heat expand the cylinder—the blank, inside the mold. After that I reversed the whole thing—set it on a ring, and pressed the core down a little further, so as to give it more pressure sideways. After that we pushed the core out, and put the whole thing into the ice-box again—the mold and the blank inside and all—and waited a little while until the duplicate was small enough to withdraw it easily by a longitudinal movement.

1014

11 Q. When did you first carry out such a process as you have above elaborately described?

1015

A. That was in 1889; the winter from 1888 to 1889.

12 Q. Can you produce the matrix in which you first carried out this process?

A. This is the matrix that I used without end rings when I first tried the process. I know it by the brass shell around it, because I had to strengthen it to withstand the pressure.

The matrix referred to is introduced in evidence and marked "Edison Exhibit First Wurth Mold." 1016

13 Q. I understand from your evidence that in the winter of 1888 or 1889 you made copies from the matrix just introduced in evidence by introducing a wax-like material therein in the form of a cylinder, and expanding it by heat and pressure into engagement with the metallic record surface of the matrix,



1017

after which the duplicate so secured was removed by direct longitudinal movement. Is that correct?

A. Yes, sir.

Question and answer objected to as leading.

14 Q. How thick were the duplicates that you made at that time?

1018 A. We preserved the same size of core and the same outside diameter. Thickness of an ordinary phonograph record, with the exception that the surface inside was smooth, of course, for pressing and ordinary records have corrugations inside.

15 Q. Were copies such as you made of sufficient thickness to maintain their shape during and after the act of disengagement from the matrix, as distinguished from one which was collapsed?

A. After taking them out of the molds they were perfectly rigid.

1019

Same objection.

16. Q. Did you make any other molds or matrices in the year 1889?

A. Well, I made a lot of them; I made a whole series from A to X—twenty-three or twenty-four—from 1888 to 1889.

17. Q. Did you make duplicate copies in those matrices.

1020 A. I made them occasionally, but I didn't preserve any.

18 Q. And by what process did you make these copies from the matrices?

A. By the process I described—by expanding.

19 Q. And were these other matrices that you made in 1889 made by the same process as that you described?

A. The same.

20 Q. Did you do anything with the process in 1890?

1021

A. Yes, I carried on experimenting all the time, trying to improve the plating, gold plating and the copper plating, and then after we had the molds pretty perfect we started on pressing again, pressing duplicates.

21 Q. Can you produce one of the molds which you made in 1890?

A. Yes, sir; I produce a mold which I think I made in 1890, but not later than 1891, by the same process.

1022

The matrix referred to is introduced in evidence and marked "Edison Exhibit Wurth Mold of 1890."

22 Q. Did you make copies from this matrix last referred to?

A. I made some.

23 Q. By what process?

A. By the same process, pressing hot and inserting the blank, and heating and expanding and cooling afterward.

1023

24 Q. What kind of duplicates were made?

A. On the same ordinary phonographic waxlike material of the usual thickness.

25 Q. Did you make any other matrices in 1890?

A. From the winter of 1890 to 1891 I made a second series, as stated, numbered 1 to 87, and some lettered ones.

26 Q. Did you make duplicate copies in each of these matrices?

1024

A. Not in each of them; many of them I didn't finish.

27 Q. Can you give any estimate of the number of duplicates that you made in the year 1890?

A. I made just a few; I can't tell how many—just a few to try the molds.

28 Q. Can you produce any of the duplicate copies made by you from any of the matrices made in 1890?



1025

A. I produce a duplicate copy made in 1894 from one of the 1890 molds.

The duplicate copy referred to by the witness is introduced in evidence and marked "Edison Exhibit Wurth Duplicate from 1890 mold."

29 Q. Can you produce a matrix made in 1891 with which you carried out the process in controversy?

1026

A. I produce a matrix made in 1891, numbered 75, and containing a phonographic record called "The Song that Breaks my Heart."

The matrix referred to by the witness is introduced in evidence and marked "Edison Exhibit Wurth Mold of 1891."

30 Q. How was this matrix made?

A. It was made the same way as all the others.

1027

31 Q. How were duplicate copies made from it?

A. In the same way as I have already described.

32 Q. Can you produce a duplicate record made in 1891?

A. This is one of them.

The record referred to by the witness is introduced in evidence and marked "Edison Exhibit Duplicate from 1891 Mold."

1028

33 Q. With reference to "Edison Exhibit Wurth Duplicate from 1890 Mold," is this the only duplicate you made from that mold?

A. No, I made over a thousand of them, of which this is one.

34 Q. You spoke, in describing the process, of the employment of end rings for holding the wax-like blanks in place in the matrix. Can you produce a matrix equipped with the rings referred to?

A. This is the first one.

35 Q. When was this made?

A. That was made in the spring of 1889 by the same

1029

process. Some copies were made, but were not satisfactory.

The apparatus referred to is introduced in evidence and marked "Edison Exhibit Complete Mold of 1889."

36 Q. When you used the several matrices to which you have above referred, did you make use of clamping rings, such as are shown in this exhibit?

1030

A. Not in the very first one to which I have referred, but in all the others.

37 Q. Did you continue to make matrices and secure copies therefrom from 1891 onwards or not?

A. I kept busy on it most all the time, trying to improve the plating and improve the pressing.

38 Q. Was the process as carried out by you from 1891 onwards the same as that which you have described or different?

A. It was practically the same.

1031

39 Q. To what extent were there variations in the process?

A. May be in pressing, heating more or less or pressing more or less, or changing the sizes of the blanks, making them a few thousandths more or less, or the time—the time for pressing was the most delicate; that took long experimenting to obtain the best results. But in all the processes which I carried out the matrix was made as I have described, and the copies were obtained therefrom by expanding under the presence of heat, as explained.

1032

40 Q. Without going elaborately into further details, Mr. Wurth, can you produce matrices or molds made by you, for example, in the years 1893, 1896 and 1897?

A. Yes; I produce matrices made in the years mentioned by the same process, and from which duplicates were made as I have already explained.

The three different matrices referred to by the witness are introduced in evidence and



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marked respectively "Edison Exhibit Wurth Mold of 1893," "Edison Exhibit Wurth Mold of 1896" and "Edison Exhibit Wurth Mold of 1897."

41 Q. With reference to "Edison Exhibit Wurth Mold of 1896," I notice that it is very much larger than the others. Please tell me generally what the history of this mold is?

1034

A. Mr. Edison had made a machine, which he called his "400-thread machine," for receiving a blank  $2\frac{3}{4}$  inches in diameter and 6 inches long, with 400 threads per linear inch, his purpose being to make a machine which would take a very long record. He believed that by making a machine having a record of this relatively great size and fineness of thread a sufficiently long record could be made to make the phonograph a more valuable instrument, and he stated to me that if duplicates could be accurately

1035

obtained from such an original record the process would be much more valuable. This machine was made in 1895 or 1896, and I carried out the process with masters made thereon, the matrix being made and copies obtained therefrom as I have described; but, owing to the fineness of the thread and of the great length of the record, the operations were very delicate ones, and the practical carrying out of the process involved a great deal of careful experiment. Much of my time from 1893 to 1896 was spent in carrying out

1036

Mr. Edison's suggestions for making recorders by means of which more perfect masters could be secured and reproducers for effecting a more perfect reproduction from the duplicates.

42 Q. About how many duplicate copies did you make from this big matrix?

A. Twelve or fourteen.

43 Q. Are you still carrying out the process?

A. Yes, sir; still working on it.

44 Q. Can you produce a mold made in 1900, for instance?

1037

A. Yes, I produce a matrix made in 1900 by me by the same process, and from which duplicates were made by expansion under heat, as I have already described.

The matrix referred to is introduced in evidence, and marked "Edison Exhibit Wurth Mold of 1900."

45 Q. How perfect was the process in 1890, for example; how perfect were the duplicates that you got? 1038

A. At that time we used the ear tubes only and not the horn, and the duplicates were loud enough for ear tubes, but not for horns. The quality was very good. Duplicates from "No. 75" are as good as those which are made now, though not quite as loud.

By "No. 75" the witness has reference to "Edison Exhibit Wurth Mold of 1891."

1039

46 Q. Along what lines did your experiments run in the commercial development of the process?

A. During all these years I was seeking to improve the quality and loudness of the duplicates, and to this end directed my attention to the making of the original masters, so that they would be more perfect, and to the perfection of the details of the process, by means of which there would be less likelihood of failure, since, owing to the very delicate operations they have to be carried out under uniform temperatures and with great care. As I have already said, much of my time was also spent in experimental work with recorders, by which the quality of the masters would be improved, and also in work on reproducers for more loudly reproducing from the duplicates. This work occupied most of my time from 1889, when I started in on it, up to the present time. 1040

47 Q. Having reference to the records made, for ex-



1041

ample, in 1897, what were they used for ; do you know what they are used for ?

A. They are used as masters to make machine duplicates from.

48 Q. So that, in 1897, as I understand it, you considered the resulting duplicates to be substantially perfect ; is that correct ?

A. Yes, sir ; it was considered good.

1042 49 Q. During the time that you were working on this matter, how often did you see Mr. Edison about it ?

A. When he was here, I saw him at least every week, once or twice.

50 Q. Did he assist you at all ?

A. Well, he gave suggestions, especially about the recorders, and about making the molds, generally, too.

51 Q. Can you give me any idea, Mr. Wurth, how many matrices were made by you under this process from 1889, when you started in on the work, up to March, 1898, or up to the first of 1898 ?

1043 A. About three hundred matrices, all by the same process.

52 Q. Can you tell me about how many duplicate copies were made altogether during the same period ?

A. About six or seven thousand, perhaps eight thousand, all by the same process. All of the duplicates were made of the usual phonographic wax-like material and were of the usual thickness.

53 Q. In withdrawing all the copies, were they shrunk and withdrawn longitudinally or not ?

1044 A. Withdrawn longitudinally, yes, sir, without being collapsed.

CROSS-EXAMINATION BY MR. SHERIDAN :

54 x-Q. What became of all of the remainder of that thousand phonograms or duplicates which you said were made in 1890 ?

A. I saved about a half a dozen of them and the others we destroyed again ; melted them up.

55 x-Q. Have any of those phonograms been sold ?

1045

A. No, sir.

56 x-Q. Have you sold any of the phonograms up to the present date?

A. Of our duplicates, you mean.

57 x-Q. Of your duplicates.

A. No, sir.

58 x-Q. Are you still experimenting on the making of these duplicates and matrices?

A. Yes, sir.

59 x-Q. You made an affidavit in this application, did you not, Mr. Wurth? 1046

A. I think I did.

60 x-Q. The affidavit I refer to was executed by you somewhere around August 29, 1898. Do you recollect it?

A. I recollect it, yes, sir.

61 x-Q. Did that affidavit refer to experiments made by you while you were in the employ of Mr. Edison in regard to this process?

A. I think it did.

1047

62 x-Q. In speaking of the Edison process in this affidavit, you said that you usually heat the blank after it has been inserted in the mold to a temperature of 115° Fahrenheit, and that this heating does not in any way affect the brittleness of the blank, nor does it make it plastic. Was that true?

A. Yes, sir; that is true.

63 x-Q. Again you stated in that affidavit that you found it impracticable to heat a blank to the plastic point after its introduction into the mold. Was that true? 1048

A. I think it is.

64 x-Q. Did you ever make a celluloid copy by that process?

A. I did lately, last winter.

65 x-Q. But you didn't make any celluloid records prior to 1898?

A. No, sir.

66 x-Q. Did you, or did you not, soften any of these phonograms in making them, preliminarily?



1049

A. Not preliminarily; they were not softened except to heat them so much that they would take the impression after they were introduced into the mold.

67 x-Q. Now, in that affidavit, when comparing it with the process described in the Young patent, which was a reference, you said that the heating of the duplicate in the Edison process was for the purpose of expanding the blank into engagement with the record, and not in any way to affect the brittleness of the blank

1050 Was that true with your experiments?

A. Yes, sir; that is true.

68 x-Q. Then there was no softening other than there was by the slight raising of temperature from the normal temperature to about 110 or 115 degrees?

A. That is all.

69 x-Q. Now, as regards the making the matrix, the deposit *in vacuo* of a metallic film upon the original master was done for the purpose of getting and forming the indentation of the matrix?

1051 A. Yes, sir; getting the conducting metallic surface on the master.

70 x-Q. Now, the electroplating on that was to form a backing and support for that electro-vacuous deposit?

A. No, it is not exactly like that. The plating in vacuum is to give the master record a metallic conducting surface, so that the copper will deposit on there because the wax itself is non-conducting; it wouldn't deposit on the bare wax.

1052 71 x-Q. Now, let me make this clear. The deposit of a metal in the vacuum when the matrix is formed still forms the inner surface of the matrix and is a part of it. Is that true or not?

A. Yes, it is true.

72 x-Q. And that thin film of metal always stays as a part of the matrix?

A. It unites with the matrix.

73 x-Q. Did you ever try to make a record by coating the original wax master with plumbago?

A. Yes, sir.

74 x-Q. But you abandoned that for the electro deposit *in vacuo*?

A. I found it made a poorer duplicate.

75 x-Q. And when you made that duplicate in that way by the use of plumbago the plumbago did not unite to form a portion of the matrix?

A. No, sir; it left the copper bare.

76 x-Q. And you didn't consider that a practicable process?

1054

A. No, I did not; I didn't consider it good, because the copper deposits in a rougher state than it does in the gold, and the cylinders are rougher and more scratchy—not satisfactory.

77 x-Q. Between 1888 and 1899 you didn't consider this process at all as applicable to celluloid, did you?

A. No, I did never think of making celluloid duplicates.

78 x-Q. Now, with your knowledge of the art, do you think, or did you think, it was possible to take a strip of celluloid, or a cylinder of celluloid, and place it within the mold or matrix and expand it by heat alone to get an impression thereon?

1055

A. Never possible. It takes a pretty strong pressure to make an impression on the celluloid.

79 x-Q. Then the celluloid records which you did make you made after seeing or being told of Mr. Lambert's patent, did you not?

A. No, sir; I made experiments with celluloid before I heard of Mr. Lambert's patent.

80 x-Q. That was in 1899, was it not?

1056

A. I started on it in November or December, 1899.

81 x-Q. When were you first informed of the Lambert patent that is in this interference?

A. Last summer—some time about May or June.

82 x-Q. In making a celluloid phonogram did you soften the celluloid phonogram before you placed it in the mold?

A. No, sir.

83 x-Q. Was it made by the process the same as the issue of this interference.



1057

A. I made it the same way as I made the wax duplicates.

84 x-Q. Did you depend on pressure entirely to force it into the indentations.

A. Pressure and heating, of course.

85 x-Q. About what degree of temperature did you heat it to ?

A. It must have been over 200.

1058 RE-DIRECT EXAMINATION BY MR. DYER :

86 Re-d. Q. You said, in answer to Mr. Sheridan's question, that you were experimenting with the process at the present time. Did you mean to convey the impression that the process was still in an experimental condition ?

Question objected to as leading.

1059 A. Oh, no.

87 Re-d. Q. As I understand your examination-in-chief, you said that in 1897 copies were made by the process which were perfect enough to be used as masters in a mechanical duplicating process; is that correct ?

Same objection.

1060 A. Yes, sir, that is all right. What I mean by experimenting any longer is to make the process more perfect and to reduce the expense of carrying it out.

88 Re-d. Q. When you subject the blanks to heat, Mr. Wurth, does the surface become plastic enough to receive an impression ?

A. If you heat it enough, yes. It will receive an impression practically cold, but so slight that it is useless. You have to heat it to a certain degree to make the wax soft enough to take the impression perfectly.

89 Re-d. Q. If you should heat a phonograph blank made of the usual waxlike material to the same tem-

1061

perature that it is heated in carrying out the process, which, I understand, is between 115 and 120 degrees Fahrenheit, and should drop it on the floor, would it break?

A. It would break.

90 Re-d. Q. So that it would still be brittle?

A. Yes.

Signature waived by consent.

1062

### Jonas Walter Aylsworth.

JONAS WALTER AYLSWORTH, a witness produced on behalf of Edison, having been first duly sworn, on oath doth depose and say, in answer to questions by MR. DYER, as follows:

1 Q. What is your name, age, residence and occupation?

1063

A. Jonas Walter Aylsworth; age, 32; residence, 223 Midland avenue, East Orange, N. J.; occupation, chemist. I have my own laboratory.

2 Q. Have you ever been employed by Mr. Edison?

A. Yes, sir.

3 Q. Were you employed in the laboratory here in October, 1888?

A. Yes, sir.

4 Q. Did you know Dr. Schulzberg at the laboratory?

1064

A. I did.

5 Q. What were you working on in October, 1888?

A. On the wax cylinder; different compositions; experimenting to improve the same and develop new compositions; as a chemist.

6 Q. Did you work in the same room with Dr. Schulzberg?

A. Yes, sir.

7 Q. What was Dr. Schulzberg working on at that time?



1065

A. On this duplicating method ; method of making molds and duplicating the records.

8 Q. Did you see Dr. Schulzberg carry out any duplicating process in October, 1888 ?

A. Yes, sir.

9 Q. I wish you would please describe to me as fully as is possible what the process was that you saw Dr. Schulzberg carry out at that time ?

1066. A. He had a mold similar to that (the witness refers to " Edison Exhibit, Original Schulzberg Mold ") and he placed a cylinder of wax composition inside of it, and then sealed the ends around the joint between the mold and the cylinder with wax, and then placed it in a bath of warm water that was capable of being sealed up and connected to a hydraulic press, so that he got the pressure of the water in this reservoir where he had the mold, the idea being that the water would press against the inside of the cylinder and against the walls of the mold, so as to force the cylinder into contact with the record on the inside of the mold. Then he removed the mold and cylinder, and subjected them to cold to allow the wax to contract loose from the mold, after which the duplicate copy so obtained was removed by direct longitudinal movement.

1067

10 Q. Did you see Dr. Schulzberg make the mold ?

A. I saw him during the operation of making the mold. I never followed the operation clear through, but I saw the plating of the cylinders accomplished, and also saw him have the plated cylinder in the bath, plating the copper to reinforce the—

1068

11 Q. You saw him plate copper on an original record, did you ?

A. Yes.

12 Q. Did you notice whether the original record was covered with a conducting coating or not ?

A. It was ; it was covered with silver at that time.

13 Q. Did you see the original silver coating ?

A. Yes.

14 Q. Do I understand that you saw Dr. Schulzberg

1069

at this time made molds by coating an original record with silver and then electroplating on the silver?

A. Yes.

15 Q. Since 1888, have you been engaged off and on at work in the laboratory as a chemist?

A. Yes, sir; came back here in 1892, and was back at different times, but had no regular place here. I was here off and on.

16 Q. So that you have not been directly connected with experimenting on the process in controversy? 1070

A. No; I have not been experimenting on that except to make the blanks for it. I made some special compositions for Dr. Schulzberg during the time that I was employed here.

17 Q. I wish you would look at the several molds or matrices on the table before you, and state if you saw matrices similar to these during the years 1891 to 1898, when you were engaged in work in the laboratory.

A. Yes, sir, I have; they are all familiar (referring 1071 to the matrix exhibits).

CROSS-EXAMINATION BY MR. SHERIDAN:

18 x-Q. You couldn't tell of your own knowledge, could you, whether these phonogram duplicates being made were softened or not?

A. Well, I know, as a chemist, that the hot water that he put them in must have softened the wax.

19 x-Q. About what temperature was the water, do you know? 1072

A. Well, I know it felt warm to the hand.

20 x-Q. Somewhere around 100° to 115°?

A. Yes, fully that; perhaps more than that.

21 x-Q. The hot water running through there was for what purpose—to expand it by heat or to soften the records?

A. To soften the record or expand, both. He had them fit very close, and naturally it would expand at the same time that it softened.



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22 x-Q. Leaving out any incidental things that may follow from running the hot water through there, what I want to know is, was the hot water run through there for the purpose of expanding the records or was it run through for the purpose of just softening them?

A. I think more for softening them, and depending further on the pressure for expanding.

23 x-Q. Did you see any of these matrices or molds being made at all?

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A. Yes, sir.

24 x-Q. How was it that your attention was directed to their being made. Was it merely for curiosity, or did Dr. Schulzberg call your attention to it?

A. Well, curiosity; and also attracted to it as being a new scientific experiment, and a very attractive one.

25 x-Q. You understood, however, that these were experiments the doctor was making for the purpose of arriving at a satisfactory method of making duplicate phonograms; is that true?

1075

A. Yes, sir.

26 x-Q. The silver coating which you saw on the master records was afterwards incorporated as a part of the matrix, was it not?

A. It was; yes.

27 x-Q. Did you hear any of the duplicate phonograms placed on a machine for reproducing?

A. Yes, a number of them at that time.

28 x-Q. Do you know what the effect would be if one of those master blanks with the silver coating was placed in a phonograph; would it give a distinguishable sound, or would the deposit of metal obliterate the sound?

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A. No, you could reproduce it on top of the silver, the silver was so thin.

29 x-Q. You never heard one reproduced, though, on top of the silver; did you?

A. It is my impression that I have heard it, but I am not positive as to that.

30 x-Q. The silver coating, however, became a part of, and incorporated in, the matrix?

A. Yes, sir.

1077

## RE-DIRECT EXAMINATION BY MR. DYER :

31 Re-d. Q. Were the duplicate records which you say you heard reproduced in 1888 distinguishable ?

A. Oh, yes, it was quite as good as the original selection at that time.

## RE-CROSS-EXAMINATION BY MR. SHERIDAN :

32 Re-x-Q. That is, it was distinguishable through and by the aid of ear tubes ? 1078

A. Yes, sir ; that is what we used at the time.

33 Re-x-Q. But not by a trumpet ?

A. I can't say not by a trumpet, but at that time we only used the ear tubes.

Signature waived by consent.

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**Albert Wurth.**

ALBERT WURTH, a witness produced on behalf of Edison, having been first duly sworn, on oath doth depose and say, in answer to questions by MR. DYER, as follows :

1 Q. What is your name, age, residence and occupation ?

A. Albert Wurth ; age, 23 ; residence, 177 East High street, Orange, N. J. I assist my father, Charles Wurth, in his experimental work in the Edison Laboratory. 1080

2 Q. When did you enter the Edison Laboratory ?

A. About July, 1894.

3 Q. What was your father working on at that time ?

A. He was working on making molds from phonographic records, plating records and making molds.

4 Q. Did he make any duplicate copies from the molds ?

A. Yes, sir.



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5 Q. How did he make the molds when you went into the laboratory?

A. First he coated them with a coating of gold, the master record, and then he made a copper mold from it by electro-deposition. When he had the mold made he made a duplicate copy of it by introducing a wax blank and pressing, so as to cause it to expand and engage the record cylinder with the mold, in the presence of heat. He then cooled the copy so that it

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would contract and pulled it out longitudinally.

6 Q. Have you been working on this process since 1894 up to the present time with your father?

A. Off and on; I have not been working steady at it.

7 Q. Has the process been varied in any way from that which you have described?

A. Not that I can say. No, it is about the same, except perhaps in small details.

1083

8 Q. I wish you would look at the matrices on the table in front of you and say whether or not these are like the matrices which you and your father have made in the laboratory from 1894 up to the present time?

A. This is the style of matrices which we have made.

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The witness refers to the several matrices having brass jackets and identified respectively as "Edison Exhibit Wurth Mold of 1890," "Edison Exhibit Wurth Mold of 1893," "Edison Exhibit Wurth Mold of 1897," and "Edison Exhibit Wurth Mold of 1900."

9 Q. Have you made many duplicate copies from molds of this character during this time?

A. Yes, sir.

10 Q. About how many have you made; have you any idea?

A. Well, from one mold I have made a thousand.

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11 Q. When did you make these thousand duplicates ?

A. That was when I first came in, in 1894 ?

12 Q. Did you test the duplicates that you made at that time ?

A. Quite a number of them ; yes, sir.

13 Q. Did you find that there was any deterioration in quality. Was the last one as good as the first ?

A. Yes, sir ; any was as good as the first.

14 Q. And all of these duplicates were made on the usual waxlike phonograph blanks, as I understand you ?

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A. Yes, sir.

Cross-examination waived.

Signature waived by consent.

It is hereby stipulated, by and between counsel for the respective parties, that the several exhibits introduced in evidence, both on behalf of Edison and of Lambert, shall be retained in custody of the respective counsel until the day of hearing and then produced.

1087

**Notary's Certificate.**

1088

STATE OF NEW JERSEY, }  
County of Essex, } ss. :

I, ALPHONS WESTEE, a notary public within and for the County of Essex and State of New Jersey, do hereby certify that the foregoing depositions of Thomas A. Edison, Charles Wurth, Jonas Walter Aylsworth and Albert Wurth were taken on behalf of Thomas A. Edison, in pursuance of the notice hereto annexed, before me, at



1089

the Edison Laboratory, in Orange, in said county, on the 21st day of February, 1901 ; that each of said witnesses was by me duly sworn before the commencement of his testimony ; that the testimony of each witness was taken stenographically, by consent of counsel, by Miss Isabel McIntosh, in my presence ; that the opposing party, Thomas B. Lambert, was represented by counsel, Thomas F. Sheridan, Esq., during the taking of said testimony ; that said testimony was taken at Orange, New Jersey, as aforesaid, and was commenced at 11:30 A. M. on the 21st day of February, 1901, and was concluded at 4:30 P. M. on the same day ; that I am not connected by blood or marriage with either of said parties, nor interested directly or indirectly in the matter in controversy.

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[SEAL]

In testimony whereof, I have hereunto set my hand and affixed my seal of office, at Orange, in said county, this 27th day of February, 1901.

1091

A. WESTEE,  
Notary Public.

**Edison Exhibit Extract from Edison  
Caveat. A. W., N. P.**

1092

DEPARTMENT OF THE INTERIOR,

[Coat of Arms]

UNITED STATES PATENT OFFICE.

TO ALL PERSONS TO WHOM THESE PRESENTS SHALL COME,  
GREETING :

THIS IS TO CERTIFY That the annexed is a true copy from the Records of this office of an Extract from page 29 in the matter of the Caveat of Thomas

1093

A. Edison, Filed October 26, 1888, for Improvements in Phonographs.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this 16th day of February, in the year of our Lord one thousand nine hundred and one, and of the Independence of the United States of America the one hundred and twenty-fifth.

[SEAL]

1094

C. H. DUELL,  
Commissioner of Patents.

(Ten-cent internal revenue stamp ; cancelled.)

(Extract from Page 29)

SPECIFICATION FORMING PART OF CAVEAT FILED OCTO 26-1888, BY THOMAS A. EDISON, FOR PHONO-  
GRAPHS.

1095

# EXTRACT FROM SPECIFICATION.

For reproducing records, or rather duplicating the same, I coat the surface of the cylinder with say silver by electro-vacuum process, then plate the outside  $\frac{1}{8}$  inch thick with copper, put the cylinder on a mandril, true the outside by grinding to a taper, fit this in a taper steel die, then dissolve wax or other material out, and then put in a blank cylinder of plastic (when hot) material, force in a plunger, spread the same against the record and then allow the same to cool. It will contract sufficient away from the record to allow of its being taken out.

1096

[ENDORSED:]

U. S. Patent Office. Copy made Feb. 16 1901.  
25737-1901.



1097

**Exhibit F—Lambert's Interference Record  
—Taylor Affidavit.**

IN THE  
UNITED STATES PATENT OFFICE.

INTERFERENCE No. 20,534.

1098

THOMAS B. LAMBERT

VS.

THOMAS A. EDISON.

Record Cylinders  
for Phonographs  
and Methods of  
Producing the  
Same.

**Preliminary Statement of Thomas B.  
Lambert.**

1099

THOMAS B. LAMBERT, being duly sworn, doth depose  
and say :

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That he is a party to the interference declared by the Commissioner of Patents, May 16th, 1900, between the first claim of his letters patent, granted March 20th, 1900, No. 645,920, and claim 11 of an application of Thomas A. Edison, of Llewelyn Park, New Jersey, for Record Cylinder for Phonographs and Methods of Producing the Same; that he conceived the invention claimed in claim 1 of his patent declared to be involved in this interference during the month of May, 1892; that no drawings were made of the invention before the Patent Office drawings were made; that during the summer of 1893 he disclosed or first explained the invention to others; that during the fall of 1893 he made a working model by the process set forth in the declaration of interference; that he embodied a full-sized apparatus and reduced it to practice in September of 1897; and that in such reduction to practice, a full-sized apparatus was successfully operated in

1101

Chicago, Illinois, at 67 and 69 Lake street, same place, and that about two thousand of these record cylinders have been made, placed upon the market and successfully operated by the process contained in the first claim of his patent declared to be involved in this interference; and that wherever used they have given satisfaction.

THOMAS B. LAMBERT.

Subscribed and sworn to before me this 23rd day of May, A. D. 1900.

1102

H. I. CROMER,  
Notary Public.

[SEAL.]

## UNITED STATES PATENT OFFICE.

INTERFERENCE No. 20,534.

1103

THOMAS B. LAMBERT

VS.

THOMAS A. EDISON.

Record Cylinders  
for Phonographs  
and Methods of  
Producing the  
Same.

Testimony on behalf of Lambert, taken this 5th day of February, A. D. 1901, beginning at 10 o'clock A. M., before Annie C. Courtenay, Notary Public, at the office of Thomas F. Sheridan, 204 Dearborn street, Chicago, Illinois, pursuant to stipulation by counsel.

1104

Present, on behalf of Lambert, THOMAS F. SHERIDAN; and on behalf of Edison, FRANK L. DYER.

THOMAS B. LAMBERT, a witness produced, sworn and examined on his own behalf, in answer to questions by Mr. Sheridan, deposes and says as follows:

Q. 1. State your name, age, residence and occupation.



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A. Thomas B. Lambert ; thirty-six years ; 183 Belden avenue, Chicago, Illinois ; I am now engaged in the phonograph business.

Q. 2. Are you the Thomas B. Lambert named in patent No. 645,920, granted March 20, 1900 ?

A. I am.

Q. 3. Have you read the statement or count in issue in interference No. 20,534, declared between yourself and Thomas A. Edison, May 16, 1900, and do you

1106 understand the same ?

A. I have read the same, and understand it.

Q. 4. Please state when your thoughts or attention were first directed towards the subject-matter of the letters patent above referred to, and which is substantially the count in issue.

A. In the early part of 1892.

Q. 5. Will you kindly state when and where you were at that time, and how your thoughts were directed towards the subject-matter of the invention, giving it as fully in detail as you can remember ?

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A. At that time I was passing the store of Atwood & Company, then located on Madison street, Chicago—I think on the corner of Dearborn, or near it—and noticing that they had what I afterwards found to be an Edison phonograph on exhibition, I stopped with others to listen to the same, this being my first recollection of ever hearing a phonograph record made of wax. The particular care with which they handled the record struck my attention, and I mentally compared it with the tin-foil record which I had heard

1108

some years previously at Cleveland, Ohio. This wax record I remember as being an advertising record of some kind, either in whole or in part ; I do not now remember. The advertising matter referred to clothing made by Rogers, Peet & Company, or a similar name. What causes me to remember that name is the fact that I did not know of any such firm in Chicago, and presumed that it was some contributory firm, or some firm making clothing for them. Noticing the care with which they handled these records, as before

stated, I at once conceived the idea of making them so they could be readily handled and not easily broken. My work being of an electrical nature (being then employed by the City of Chicago in the electrical department), together with the thought of using hard rubber or celluloid, or something of that kind, brought the subject to my mind, and either then or a short time afterwards the process developed practically in my mind to the results which I subsequently completed.

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Q. 6. What was this process that you speak of?

A. This process consisted of copying the wax record negatively, as it were, by making an electrolytic matrix and using it on which to mold or form the hard rubber or celluloid. This was to be done by pressure.

Q. 7. Please state, if you can, why you fix on the year 1892 for this earliest conception.

A. I simply know that it was about a year previous to the World's Fair, and I know that it was the year in which I was married. I have stated in my preliminary statement that it was in May, and that is the best of my recollection.

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Q. 8. Without referring to your preliminary statement at all, will you kindly state, if you can now remember, what month it was during the year 1892 that you conceived this invention above referred to by you?

A. I think it was just after warm weather set in, because I was then employed in the telegraph service of the city, and was doing some work on some five-wire cables running along the south side of Madison street. This brought me past the store of Atwood & Company, which first started the conception of the invention.

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Q. 9. When, if at all, did you first talk to others of this invention, and who were they?

A. I have now forgotten those that were with me at the time; but I think that a person of the name of Tompkins was then working with me, and I presume that I spoke to him about it at that time, but do not



1113

now remember. My first distinct recollection of saying anything definite to others about it was the following spring. This was during the year of the World's Fair, when I met a person by the name of Taylor, either in a phonograph parlor on Madison street—No. 98—or at the World's Fair grounds. We were then listening to a record, and I remarked to him in an off-hand sort of a way that I could beat that kind of work. This seemed to strike his attention at once, and he

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became very much interested and said, "Can you?" and I replied, "Yes, I know I can." The conversation after that was more with reference to the making of a celluloid record in tape form, because then I conceived—as a subsequent conception—rolling these records up on spools in order to save space, which, however, I afterwards abandoned. Subsequently—in warm weather—I met Taylor—I rather think he came to my house at this time—and I then showed him one of my early attempts at making a celluloid record. This was

1115

in the fall, or latter part of the summer—because it was quite warm weather—of 1893. It was partially through his advice with regard to this matter that I subsequently left the employ of the city to undertake to develop the phonograph business along these lines.

Q. 10. Was it in the spring, summer or fall of 1893 when you had your first talk with Mr. Taylor?

A. It was in the early part of the year—I judge the spring.

Q. 11. Can you fix the month?

1116

A. I cannot definitely.

Q. 12. Did you disclose it to anyone else at or about that time? If so, to whom?

A. I do not think I disclosed it to others at that time, except it may have been to a person of the name of R. E. Hamilton, who is about the only person, other than Taylor, that I have ever taken into my confidence with regard to this matter, until recently.

Q. 13. As near as you can recollect, when did you talk to Mr. Hamilton about the process for producing your record?

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A. As near as I can recollect, it was somewhere in 1895, but I can give no definite date.

Q. 14. When did you talk with Mr. Taylor again about the invention, after your first disclosure to him early in 1893?

A. I think it was about three months afterwards; it was later in the summer.

Q. 15. How fully did you go into it with him the second time?

A. The second time I went into it by briefly describing how I made the matrix—I did not then call it a matrix—and forced or pressed a strip of heated celluloid against it to make the record. I had previously tried engraving on the celluloid, which I tried to soften to an engraving condition by the use of alcohol and ether, these being the only celluloid solvents of which I then knew. This engraving proved very unsatisfactory, and I so told him. I think he was present on one occasion at my house when I tried to engrave, but I did not care to show him, or anyone else, the details of the other process, being of a rather suspicious nature.

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Q. 16. When did you first tell Mr. Taylor about the process which forms the subject-matter of the interference?

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A. I told him this in the fall of 1893.

Q. 17. Kindly state, as near as you can, what you told Mr. Taylor at that date—the fall of 1893—as constituting your process for making celluloid records?

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A. He was at my house, and the subject-matter came up in some way—just how I do not recollect, but what I do recollect is telling him that I had made an electrolytic copy of part of a wax record and had taken an impression from it in celluloid. He at once thought he saw great possibilities in this as a business, if it could be developed into a practical shape, in which condition it was not at that time, inasmuch as I was using only sheet celluloid which I could buy at the stores. The celluloid I was using at that time was



1121

bought at some art store on Madison street—I think A. H. Abbott's. Mr. Taylor was very enthusiastic, and his enthusiasm at once wakened in me hopes and desires in this line which made me think of leaving my position to engage in this work. This thought was a very impressive one to me, inasmuch as I am of the opinion that it required a good deal of courage to leave a position bringing me in a certain revenue to embark into something that had a measure of uncertainty. I did not give him the exact steps of the process, other than by intimation, except to say that I had made the matrix and pressed celluloid against it to make the record, which record I showed him.

1122

Q. 18. Did you or did you not tell him how the matrix was made?

A. I told him that the matrix was made electrolytically.

Q. 19. Did Mr. Taylor know what electrolysis or electrolytic methods consisted of at that time?

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A. He claimed to—that is to say, he gave me the impression that he did, but I think this impression was more a matter of desiring me to think he did at that time.

Q. 20. What did you do, if anything, toward making models of your invention, and when did you make a model of the resultant article of your process?

A. In the summer and fall of 1893.

1124

Q. 21. Please say what this process consisted of, which you say you made in the summer or fall of 1893 and what was the resultant model you refer to?

A. I had a wax record which was cracked or injured at one end, which I cut off so as to make a short piece of record, and this I covered with graphite and plated electrolytically with copper. This was done in the basement of the City Hall, which I then used as a sort of laboratory—that is to say, where I did some of my experimenting. The first matrix that I made was very thin and porous. I afterwards took another portion of this same cracked record and repeated the operation under different electrical conditions, and

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produced what I thought would answer the purpose of a mold or matrix. I afterwards took this to my home, and by taking strips of thin celluloid and cutting them the right length and breadth placed them on the inside of this matrix, and pressed them outwardly, at first by means of my fingers after dipping the celluloid and matrix into boiling water. This gave me such indications as warranted me in going further to produce a more even pressure. This I tried to accomplish by using a rubber plug, which I placed on the inside of the celluloid, which celluloid was against the inside of the matrix, then by squeezing the rubber downwards by a screw-clamp it expanded and pressed the celluloid into the matrix, thereby making a record.

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I found that I could not cement the ends of the strip together satisfactorily with the solvent that I then had, because when I placed it in the hot water, it became either too small or too large by expansion to get the record upon it complete without breaking through at the joint or some other place. I did not then work with sufficient care to produce a really practical merchantable record. My time was well taken up by my work for the city, and my experimenting necessarily from then on was intermittent, but what I showed Mr. Taylor was one of these records.

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Q. 22. Did you try that celluloid record which you made at that date?

A. I did; I tried to reproduce it on a machine; mean by that to hear it.

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Q. 23. Did it make any sounds at all?

A. It did; it made distinguishable sounds.

Q. 24. What did you do, if anything towards reducing this invention to a commercial form—that is, to practice—and when did you do it?

A. I reduced the process to practice about September, 1897. I took ordinary wax records, and by means of a multiplying pointer graphically reproduced the sound waves on a glass covered with lampblack. These I placed in a magic lantern or projecting machine in



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order to study the sound waves, so that I could compare the results which I got with those of the wax records which I was copying. This was done both at my home and at 67 and 69 Lake street, fourth floor. I was then making, as I found time, matrices electrolytically, deriving my current from a storage battery, and from these matrices I made practically sound records of celluloid. These records were made on

1130

rings of celluloid, made out of sheets, therein and outwardly expanding them, in some cases by the use of a rubber plug or by the use of gelatine and printer's roll composition, and also by a sectional expanding mandrel caused to expand by the driving in of a tapered plug. The celluloid in some instances was softened by means of heat alone, and in some instances by means of a solvent of celluloid previous to the expansion pressure. I found that in using solvents of some characters, when put too freshly into the matrix, they would adhere to

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the copper of the matrix in such a way as to prevent its easy and immediate removal. In such cases I used paraffine oil to prevent what I then thought was the attacking of the copper by some material, either in the celluloid or in the solvent. By softening the material with the solvent I found that the detail of the record was more easily and more faithfully reproduced than by using heat alone to soften it, in which latter case I required very much more pressure to accomplish the same result.

1132

Q. 25. Was the heat independent of the pressure, or was the heat used solely for the purpose of softening the celluloid record?

A. The heat was used solely for the purpose of softening the celluloid record.

Q. 26. In this reduction to practice which you have spoken of, did you take any one into your confidence or not?

A. I did; I took Mr. R. E. Hamilton into my confidence and showed him the results.

Q. 27. Did he understand the process at that time?

A. Yes.

Q. 28.

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A. Yes, sir, he did.

Q. 28. Have you any of the old models which you made back in 1893 in your possession at present?

A. I have at my house, and will produce them this afternoon.

Q. 29. How did you remove your celluloid record from your matrix?

A. I removed the celluloid record from the matrix by first removing the pressure, and when heat was used I dipped the matrix and record into cold water in order to contract it, and found that the celluloid contracted sufficiently to come out by direct longitudinal movement; but when a solvent was used, in some cases, as before stated, the record would adhere to the matrix. On account of this I tried to find some solution that would shrink the celluloid, but I afterwards found that the use of a solvent some time previous to the duplicating of the phonograms removed the difficulty, so that when the pressure was removed a reduction in temperature would allow the record to be removed from the matrix by a direct longitudinal movement. In some cases of this kind I had to use artificial refrigeration, but this I found afterwards to be unnecessary by careful attention to the amount of solvents used and the length of time elapsing between covering the blank with the solvent and forcing it into the matrix.

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Q. 30. Did you or did you not consider at that time—the fall of 1897—that you had removed the practical difficulties in making records by your process?

1136

A. I did think that I had removed the practical difficulties.

Q. 31. How many phonograms did you reduce to practice during that period, the fall of 1897?

A. Probably ten or fifteen, possibly more.

Q. 32. Did you try any of these phonograms so reproduced on a machine?

A. I did. I tried them on a lathe which I used as a phonograph at the time, both for recording and reproducing.



1137

Q. 33. Did you try it on the phonographs on the market at that time.

A. I did. I also tried it on other phonographs at my home.

Q. 34. The letters patent show that you did not file your application until August 14, 1899; will you please state why you did not file your application before such date?

1138 A. I did not file the application because I did not have sufficient funds.

Q. 35. What was your average income, including salary from all sources, during the years 1892 and 1893?

A. My average salary was \$83 a month—a thousand dollars a year.

Q. 36. Were you married or not at that time?

A. I was married.

Q. 37. What was your average salary during the year 1894 and following, up to and including 1897?

1139 A. I think I had a salary of \$83 a month up to September, 1895, and from then on up to September, 1899, I had no salary.

Q. 38. State what income you had during that time, if any?

A. During that time I was taking in what work I could get in electrical lines and in the optical line, doing odd jobs that I could get to maintain expenses; I do not think I averaged \$30 a month during that period.

1140 Q. 39. Have you any family besides yourself and wife?

A. I have one child, a girl, who was born in 1893.

Q. 40. Did you make any other inventions during this period for which you made application and which resulted in letters patent?

A. I do not think I did. I made one application, but it was prior to this.

Q. 41. When did you make that application?

A. I cannot give the date; I think it was in the early part of 1892.

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Q. 42. Did you pay the expense of the last-named application?

A. I did not. I paid a portion of it. It was taken out in conjunction with one Edward Carroll, joint inventor, who paid the balance.

Q. 43. Did you make any attempt between this period—the early part of 1892 and the date of your application—to get others interested in this invention and to furnish the necessary capital to prosecute it?

A. I tried to interest others in the invention in order to put it on the market, but without success, simply for the reason that people did not have much confidence in me on account of my financial condition. 1142

Q. 44. In speaking of your reduction to practice at 67 and 69 Lake street, were you supposed to pay rent for that place?

A. I did not go in there under the stipulation of paying a definite rent; it was a sort of conditional privilege that I was to pay something if I could. I found this shop through a friend of mine, where they had previously made cyclometers, and which, owing to the business being abandoned, had remained idle. I got the conditional privilege of using this, expecting to pay what I could for the same. 1143

Q. 45. Did you live on the income you made during this time or not? If not, did you incur any indebtedness; and, if so, is it all paid or only a portion of it?

A. During a portion of this time I incurred indebtedness for my house rent, a portion of which still remains unpaid? 1144

Q. 46. During all this time were you constantly keeping in touch with your invention and pursuing it with all the resources you could command?

A. I was. I spent all the time that I could and more than I ought to have, in view of my own immediate financial needs, in the pursuance of the phonographic record work.

Q. 47. How did you finally succeed in making the application for the patent and getting your goods on the market?



1145

A. I had conceived the idea of using these records of the indestructible nature for advertising purposes, also for novelty purposes, such as dolls and the like, and in addition to this thought of an automatic phonograph to be connected with a door, so as to be operated by the opening and closing of the same. This, I thought, would appeal to capital. In order to enlist capital in the record business, I designed a machine for the above purpose. After getting it to a stage

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which I thought sufficient for exhibition, I called on a friend of mine, whom I understood to be connected with a firm of promoters, then located in the Great Northern Building, this city. This man's name was Lewis A. Rice. I briefly told him about the advertising machine for connecting with the door and asked him if he knew any one who would be likely to invest money in such an enterprise. What his answer was I do not now remember, except that in a subsequent

1147

call I made on him, and while talking with him about it, a Mr. B. F. Philpot came into his office. Mr. Rice turned to Mr. Philpot and asked him what he thought of the proposition. Philpot gave an evasive sort of answer, such as "I don't know," and I think passed into the next room. I subsequently came into business arrangements with Mr. Philpot with regard to the advertising business, by which the funds for taking out the patents were forthcoming.

Q. 48. Did you advance any of these funds or not?

A. I did not.

1148

Q. 49. How many records in all do you think were put on the market before the date of your preliminary statement, which was the 23rd day of May, 1900?

A. I think at least three thousand.

Q. 50. How successful was the process which you used on or about the 23rd day of May, 1900, and which is described in the first claim of your letters patent?

A. It was then practically enough to enlist capital for the furtherance of the business, also to sell the advertising record.

1149

Q. 51. Is the same process in use at this date?

A. It is.

Q. 52. Is it substantially the same process as described and claimed in the letters patent?

A. It has been and is now substantially the same process as described.

Q. 53. You stated this morning that you had one of the models or a portion of a record left that you produced by your process in 1893. Have you that with you now?

1150

A. I have; and here it is. (Witness here produces model.)

Q. 54. I notice that this, which you say is a model or a portion of a model record made by you in the fall of 1893, is simply a thin, short strip of indented celluloid or similar material. Will you state of what it originally consisted, and what has become of the models with which you carried on your process, viz., the matrix and electrolytic bath, and piece of rubber for expanding?

1151

A. The model in hand—referring to the piece of celluloid—was originally a strip of celluloid approximately one-hundredth of an inch thick, such as was generally on the market at that time. The back of it has paper stuck to it. It was a cylindrical piece two and one-eighth inches in diameter, made of a strip. As to the electrolytic bath in which it was made, no attempt was made to preserve that, except during its use; and the matrix in which the record was formed has been either lost or mislaid. I have moved several times since making the matrix, and this, as well as some other effects belonging to me, have been either destroyed or lost.

1152

The strip referred to by the witness is here offered in evidence, and the notary is requested to mark the same "Lambert Model, 1893."

Q. 55. Have you any of the apparatus and phonograms which you say you used for reduction to practice with you now?



1153

A. I have, and here produce them.

Q. 56. The only part of the apparatus which you seem to have left of your 1897 experiments is a matrix. Will you please state of what it is made and how?

1154

A. The matrix was made by electrolytically depositing copper on the surface of a wax record, by having previously made the surface of such wax record conductive by an application of graphite. After the deposit of copper had attained the thickness shown here, the wax record was removed therefrom and then the matrix itself was forced upon another wax blank, which acted as a mandrel, which was placed in a lathe. I then squared the ends of the matrix, and then set it on a level plate on the inside of the brass ring, and poured plaster of paris in liquid form in the intervening space, thus forming a backing to hold the matrix in its cylindrical shape.

1155

The matrix referred to above by the witness is herewith offered in evidence, and the notary is requested to mark the same "Exhibit Lambert's 1897 Matrix."

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Q. 57. I notice that part of the exhibits which you have brought with you is a reproduced phonogram. Will you please explain in what it was made and how?

A. This phonogram was made in the matrix I have just described by first forming a ring of thin red celluloid and also a ring of heavier white celluloid of a different character. These were made so that the red ring would exactly fit on the outside of the white ring. The composite ring was then submitted for a short time to the action of a solvent of celluloid. A short time after the application of the solvent the ring, being softened by the application of said solvent, was placed within the matrix and an outward pressure given to it by means of a rubber plug; and it was then caused to expand by applying a screw pressure to its axes so as to squeeze it longitudinally and expand it radially. After remaining under pressure for a short time and in

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contact with the interior surface of the matrix, the pressure on the rubber was removed and the record taken from the matrix by a longitudinal movement.

The phonogram referred to by the witness is herewith offered in evidence, and the notary is requested to mark the same "Exhibit Lambert's 1897 Phonogram."

Q. 58. Do you still find it necessary to soften your records preliminarily before they are subjected to the action of the matrix? 1158

A. I get better results with some material by so doing.

CROSS-EXAMINATION BY MR. DYER:

x-Q. 1. Does the thin strip of celluloid marked "Lambert Model 1893" represent the thickness of the phonograms which you sought to make at that time? 1159

A. Not the finished record, because I saw they were not sufficiently thick to maintain the shape, but I was hampered by what I could buy readily, not knowing then where to buy the material. It is very easily seen that such material as that would not stand up at all unless backed by some other material.

x-Q. 2. In your application for the patent in interference, the Patent Office cited as a reference an English patent to Young, describing a process wherein very thin-walled cylinders were used; and, in pointing out the differences between your invention and that suggested by Young, you stated that you had made efforts to obtain records with thin-walled cylinders, but without success. Does your model of 1893 represent these unsuccessful experiments which you referred to during the prosecution of your application? 1160

A. It does.

x-Q. 3. And the work which you did in 1893 represents, then, the suggestions of the Young English patent, if anything, and not the suggestion of the issue in interference?



1161

A. It was a step in my development of the process, but to say that it represents what Young was doing I did not then know, nor do I know now, except that upon looking up the patent issued to him I found that he removes the record by collapsing it inwardly, which I do not now do, nor did I do.

1162

x-Q. 4. The record which is represented by your exhibit of 1893 is, however, not a record sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, as the issue in interference calls for?

A. It is not.

x-Q. 5. When you talked with Mr. Taylor in the spring of 1893 about your process, did you tell him it was one for making phonographic impressions upon very thin-walled cylinders, such as you show in your model of 1893, or not?

1163

A. At that time I had no definite conception of the thickness that it would be necessary to use—whether thin would be proper or thick necessary.

x-Q. 6. When did the idea first present itself to your mind, then, for making phonographic impressions upon cylinders sufficiently thick to maintain their shape during and after the act of disengagement from the matrix?

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A. That thought developed with the experimenting, as I saw the difficulty in getting sound results from the thin one which I made. I was compelled to mount them on other cylinders, by gluing them on or forcing them on, as it were, on a mandrel.

x-Q. 7. Were the experiments to which you have just referred carried out in 1893, or were these experiments carried out in 1897?

A. These experiments were in the interim between 1893 and 1897, gradually developing.

x-Q. 8. Can you tell me what year it was between 1893 and 1897 that a definite conception was reached as to the importance of making cylinders sufficiently thick to retain their shape during and after the act of

disengagement process?

A. During the question that if I had drawn better distinction, sufficiently the act of grew with up attempt work.

x-Q. 9. actually ex phonograph thick to m disengagement

A. Up t mounting thin wall; thick to m after remo

x-Q. 10. periments ders, such cution of y impractic receiving to mount t give them s the facts?

A. You a material—t an inch thi to cement t another pri menting the did in 1897 opment.

x-Q. 11.

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disengagement from the matrix in carrying out the process?

A. During the period named I do not think that question struck me at all forcibly, because I supposed that if I could protect myself by a patent, it could be drawn broad enough not to require any such distinction. The necessity of making them with a wall sufficiently thick to retain its shape during and after the act of disengagement, as before said, is one that grew with the experimenting up to 1897, when I gave up attempting to use a thin material for practical work.

1166

x-Q. 9. It was not, then, until 1897 that you first actually experimented with the process for impressing phonographic representations on a cylinder sufficiently thick to maintain its shape during and after the act of disengagement from the matrix?

A. Up to that time—1897—I always had trouble in mounting the records and hearing them, due to their thin wall; but the first work upon cylinders sufficiently thick to maintain their shape for any definite period after removal from the matrix was done in 1897.

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x-Q. 10. Before 1897, as I understand it, all your experiments had been made with very thin-walled cylinders, such as those to which you referred in the prosecution of your application as being unsuccessful and impracticable, and efforts were made by you after receiving impressions upon these thin-walled cylinders to mount them on suitable supporting rings, so as to give them strength and body. Have I correctly stated the facts?

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A. You are not strictly correct. While I used thin material—that is, material of about one-hundredth of an inch thick—I had used it in several layers, trying to cement them together, and putting one ring within another prior to this time. It was this kind of experimenting that led me to get heavier celluloid, which I did in 1897. It was purely a matter of gradual development.

x-Q. 11. What I would like to find out, if possible, is



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when the idea first occurred to you of making the ring sufficiently thick to maintain its shape during and after the act of disengagement with the matrix. Can you tell me at what period in the development to which you refer you reached the conclusion that it was a necessary thing to be done in order that the process might be practical?

A. According to my best recollection, that was in 1896.

1170

x-Q. 12. In other words, as I understand it, the work which preceded the year 1896 was the work which, in the prosecution of your application for a patent, you compared with the Young patent and from which you made the argument that the process of the Young patent was inoperative; while, on the other hand, your work succeeding the year 1896 alone has to do with the specific process embodied in the issue in interference. Am I correct?

1171

A. The earlier experimenting brought about the later conclusions; but in the main, as I understand the question, you are correct.

x-Q. 13. In order that my question may not be capable of misinterpretation, is it not a fact that the year 1896 marks practically the commencement or the inception of your work with processes for reproducing phonographic records on cylinders having sufficient thickness to maintain their shape during and after the act of disengagement from the matrix?

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A. That practically marks the change in my ideas from using the thin to the thicker material.

x-Q. 14. And by thin, as distinguished from thick you mean material not heavy enough or of sufficient, thickness to maintain its shape during and after the act of disengagement from the matrix?

A. I do.

x-Q. 15. Your disclosure of the process to Mr. Taylor in the fall of 1893 has reference then to a process using thin and not thick records?

A. To the use of thin records, properly backed, after

1173

disengagement from the matrix was my idea at that time.

x-Q. 16. You say in your direct examination that you also talked with Mr. Hamilton about the process in 1895. I presume that your disclosure to Mr. Hamilton, in view of preceding questions, was also limited to the use of thin cylinders properly backed after disengagement from the matrix?

A. It was.

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x-Q. 17. You also said that you talked with Mr. Taylor again two or three months after your first interview with him, and at that time described a process using a "strip" of celluloid on which to make the record. By "strip," I presume you still refer to very thin material?

A. I refer to a thin band.

x-Q. 18. In carrying out your process in 1897, when, I understand, you used a ring of celluloid sufficiently thick to maintain its shape, how close a fit did you secure between the ring and matrix when both are cold and before the formation of the phonogram?

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A. When I used heat alone to soften the celluloid preparatory to forming the impressions thereon, I tried to get a close fit, but when I used a solvent I found it necessary at that time to make the fit somewhat loose preparatory to treating the ring with the solvent, in which state it was forcibly expanded against the matrix to form the record, the solvent rendering it more plastic. In this process I have found that the use of solvents and heat have equivalent effects on material—that is, making it more or less plastic.

1176

x-Q. 19. Having reference to the process where heat alone was used and wherein, as I understand it, you fitted the ring as closely as possible to the matrix, would not the application of heat result in an expansion of the ring?

A. It would.

x-Q. 20. Did you ever try to make impressions by relying upon this expansion alone?

A. I have.



1177

x-Q. 21. What were the results?

A. The results were not satisfactory when celluloid was used.

x-Q. 22. And you find it desirable, as I understand it, after applying the heat and expanding the rings into engagement with the matrix to use other means to effect the more intimate engagement of the ring with the matrix?

1178 A. I found it desirable to use some mechanical means to that end.

x-Q. 23. Such, for example, as your expanding rubber plug?

A. Yes, sir.

x-Q. 24. To whom did you explain the process as carried out by you in 1897?

A. I explained the process to one R. E. Hamilton.

x-Q. 25. Did you tell him that the matrix was made by applying a conducting coating to a wax record and electroplating thereon?

1179 A. I do not remember telling him that in detail, it being sufficient to tell him of it, as he was more or less familiar with electrical operations.

x-Q. 26. Did he see you carrying out the process at that time?

A. He did; he saw me in the act of carrying it out.

x-Q. 27. With a thick ring?

A. Yes, sir.

x-Q. 28. You have said that during this experimental period of 1897 you made probably ten or fifteen duplicate records, and possibly more. Do you mean by this that you made this number of copies from a single matrix or did you make a number of matrices?

1180 A. I made a number of matrices, as well as making a number of copies from the same matrices.

x-Q. 29. The matrix which you have offered in evidence—"Exhibit Lambert's 1897 Matrix"—represents only one of the matrices that you made at that time?

A. Yes, sir, it does.

x-Q. 30. Were all these matrices of this character—

that is to say, phonogram cylinder?

A. At that time, yes.

x-Q. 31. And the process to complete phonogram?

A. Any section of record.

x-Q. 32. But of a complete "standard record" of about four or five minutes?

A. I did not.

x-Q. 33. But to Mr. Hamilton succeeded in the process, did you?

A. I do not know.

x-Q. 34. My understanding is so far as Mr. Taylor to him the carrying sufficiently thick after the act of that it was not explained such from the fall of not explain the process stated the facts?

A. I did not.

process in detail. So far as Mr. Taylor correct.

x-Q. 35. Do you coating the wax record process?

A. I have tried on the market, as it is technically

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that is to say, did they contain only copies of parts of phonogram cylinders?

A. At that time they only consisted of sections of complete records.

x-Q. 31. And up to 1897, then, you never carried out the process to the extent of making a copy of a complete phonograph record?

A. Any section of a record may be a complete record.

x-Q. 32. But up to 1897 you never made a copy of a complete standard phonograph record—and by “standard record” I mean one having the usual length of about four and a quarter inches—did you? 1182

A. I did not make one of the stated length.

x-Q. 33. Between 1897, when you showed the process to Mr. Hamilton, and the summer of 1899, when you succeeded in interesting the Messrs. Philpot in the process, did you explain the process to any person?

A. I do not think I did.

x-Q. 34. My understanding of the situation is that, so far as Mr. Taylor is concerned, you never explained to him the carrying on of the process, using cylinders sufficiently thick to maintain their shape during and after the act of disengagement from the matrix, and that it was not until the early fall of 1897 that you explained such a process to Mr. Hamilton, and that from the fall of 1897 until the summer of 1899 you did not explain the process to any one; have I correctly stated the facts? 1183

A. I did not, nor would not have explained the process in detail to any one, except Mr. Hamilton. So far as Mr. Taylor is concerned, your statement is correct. 1184

x-Q. 35. Do you use any special kind of graphite for coating the wax records in the carrying out of your process?

A. I have tried different varieties that have been on the market, and have also tried “floating” them, as it is technically called, so as to produce a finer



1185

grade. At present I am using the finest that we can get.

x-Q. 36. Do you know what the average diameter of the graphite particles are that you used?

A. No, sir, I do not.

REDIRECT EXAMINATION BY MR. SHERIDAN:

1186 Re-d. Q. 1. You have heard cross-question 12 and the answer thereto read (the notary having been requested to read said question and answer to the witness); did you mean to convey thereby that you had never before that time conceived the idea of using a record sufficiently thick to support itself?

A. I meant to say that about this time I concluded it was necessary to use such a record.

Re-d. Q. 2. What was the reason you used thin strips in preference to thick in the early part of your experiments?

1187 A. Because they were easily procurable, for the first reason; and, secondly, I did not then know where to get other material.

Re-d. Q. 3. Why did you contemplate using a backing for your celluloid strips in preference to using a ring of composite celluloid or a thick ring of celluloid?

1188 A. It was a matter of convenience more than anything else, inasmuch as I found I could make a record of some kind, and then by shaving a wax blank to the proper size could slip this over it, or cement it to it, thereby enabling me to hear it by means of a machine.

Re-d. Q. 4. Did you convey the impression to Mr. Taylor in your early experiments that you intended to use the thin strip of celluloid only, without any other support, either upon material of the same kind or a backing to form a complete self-sustaining ring?

A. I talked to him with reference to a strip or band of celluloid which should rest over a rigid surface, but never contemplated using a thin record in itself, without a backing of either the same or different material.

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Re-d. Q. 5. Then it was a question of the obtaining of the material that was responsible for your experiments on thin or thick materials, was it, or was it not?

A. My experiments were limited to the material that I could readily get.

Re-d. Q. 6. You have just heard question 31 and the answer thereto read (the notary having been requested to read said question and answer to the witness); did you mean to infer by that answer that your process was complete or incomplete? 1190

A. The process was complete.

Re-d. Q. 7. Then it was merely a question of a complete or incomplete record that you were considering?

A. I knew that if I could successfully make one of a short length, I could make one of any length.

Re-d. Q. 8. Did you, or did you not at any time prior to 1896 think of using thick material, such as celluloid, for the composition of your cylindrical phonogram ring? 1191

A. I do not remember of any real tangible thought to that particular end.

Re-d. Q. 9. Why did you attempt to use laminated celluloid rings—rings formed of strips of celluloid laid on one another?

A. Because in using a solvent the thinner material would have held its shape sufficiently for me to put it in the matrix.

Re-d. Q. 10. Then you used a laminated ring, if I understand your last answer, so as to make a ring sufficiently thick to place it in the matrix; is that correct? 1192

A. That is correct.

Re-d. Q. 11. When did you first use these laminated rings?

A. I presume it was either in 1895 or 1896; I cannot give any definite date about it.

Re-d. Q. 12. What was your reason for not explaining the process from the early fall of 1897 to the summer of 1899?



1193

A. I did not care to trust others with it.

Re-d. Q. 13. Did you think you had your invention reduced to practice during this last-named period?

A. I did.

Re-d. Q. 14. During this period under consideration, were you making any attempt to get others interested in it for the purpose of promoting your inventions?

1194 A. I did not try to get others interested in the invention for the process; what I did try to get others interested in was in using the phonograms formed by the process, in connection with advertising novelties.

Re-d. Q. 15. Why did you not explain the process to the people that you tried to interest in the advertising process?

A. I did not think it necessary to explain the process; and, moreover, would not have done so.

Re-d. Q. 16. Did you show these people any records made by your process?

1195 A. None of them were sufficiently interested in my proposition to bring it to that point.

Re-d. Q. 17. In other words, they turned down your proposition; is that correct.

A. It is.

#### RE-CROSS-EXAMINATION BY MR. DYER:

1196 Re-x-Q. 1. Would the thin strip records mounted on wax blanks made by you in your early experiments be infrangible?

A. The record itself would, not the backing; the thing as a whole would not be.

Re-x-Q. 2. Does not the Young English patent to which you have referred, describe the making of thin-walled cylinders from a matrix and the subsequent mounting of such cylinders on backing material?

A. I so understand it.

THOMAS B. LAMBERT.

Adjourned till Wednesday, February 6, 1901, at 10 o'clock A. M.

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Chicago, February 6, 1901. Parties met pursuant to adjournment. Present as before.

VINCENT A. TAYLOR, a witness produced, sworn and examined on behalf of Lambert, in answer to questions by Mr. Sheridan, deposes and says as follows:

Q. 1. Please state your name, age, residence and occupation.

A. Vincent A. Taylor; forty-two years; 325 Pullman avenue, Chicago, Illinois; mechanical engineer.

1198

Q. 2. Do you know Mr. Thomas B. Lambert, a party to this interference?

A. I do.

Q. 3. How long have you known him?

A. Since 1893.

Q. 4. You know, of course, that you are called on this morning to testify in an interference between Mr. Lambert and Mr. Edison, regarding processes for reproducing phonographic records. When, if at all, did you have any conversation with Mr. Lambert on this subject.

1199

A. In June, 1893, as near as I can recollect it.

Q. 5. Where were you at that time and what was the subject of your conversation?

A. I was in the World's Fair Grounds, in the electrical building, standing listening to the phonographic exhibit; and after having heard several pieces played, I opened conversation with T. B. Lambert—or he with me, I don't remember which—as to the merits of the phonographic record which we had heard, and during such conversation Mr. Lambert made the statement that he had in hand experiments that he considered were an improvement on the records he had heard, inasmuch as the records that he had in mind, or was experimenting with, were of more commercial value, as they could be mailed and handled in an indiscriminate manner.

1200

Q. 6. How do you fix that time in your mind, Mr. Taylor?

A. Because on June 1 I had an appointment with a



1201

friend to go to the World's Fair, and had to postpone it for a week or two afterwards.

Q. 7. Did Mr. Lambert in any way disclose to you at that time what he contemplated making his new record of or the process for making the record?

1202 A. Not that I distinctly remember, but when I left Lambert the day of our first meeting, I was impressed with the idea that he had some scheme for using a papier mache record covered with a film of celluloid or vulcanized rubber, or something of that description.

Q. 8. Did he contemplate at that time, or did you so understand from the impressions you gathered from him, that the record would be self-sustainable?

A. Yes, I did.

Q. 9. When did you next talk, if you did, with Mr. Lambert on this subject-matter? State it in your own way, giving all the details.

1203 A. As near as I can remember, it was from two to three months later in the year 1893. I met him, I believe, at the phonographic parlor near the corner of Dearborn and Madison streets—of this point I am not quite positive, but it was at a phonographic exhibit in this city in this neighborhood. I then opened up conversation with him again about the record he had spoken to me of at the World's Fair, and he invited me to his house, where, after playing several records for me, he produced a wax record covered with a band of copper—it might have been something else, but I remember it was metal of some kind which resembled copper.

1204 He then picked out the wax from what proved to be a matrix, and showed me impressions identical to those made by the stylus on the wax record removed from said matrix; and he also produced a thin band of celluloid, and on the celluloid face of the band were impressions identical to those, so far as I could see, of the matrix. This, he claimed, although leading up to the practical side of the celluloid record, was not practical, inasmuch as it would not sustain its own weight; and he asked me at that

time if I had purchased information, advised him to push this, thought he

Q. 10. I Mr. Lambert you have

A. Yes, after that inclined to that I was personal

Q. 11. I tion with the record they should

A. Yes, an endless

Q. 12. W was to be s

A. Yes, self-sustainable impression, a these bands chemicals.

Q. 13. D or ring was

A. No, he discussion.

Q. 14. W

A. That it out spoiling

Q. 15. W that we are

A. At our

Q. 16. D Mr. Lambert

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time if I knew where celluloid in quantities could be purchased, which I did not. That is the end of my information. On the strength of what I had seen, I advised him to drop everything he had on hand and push this to a successful issue, which he said he thought he could do.

Q. 10. Did you have any further conversation with Mr. Lambert at any time subsequent to that of which you have been speaking?

A. Yes, sir, I have had many conversations with him after that, but Mr. Lambert seemed to be either inclined to drop the matter of the records or was afraid that I was endeavoring to get information for my own personal benefit and probably to his detriment.

Q. 11. Did he at any time in your early conversation with him give you an impression as to whether the record could be made in bands, and as to whether they should be made thick or thin?

A. Yes, sir; he suggested that we make a record on an endless thin band of celluloid.

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Q. 12. Was the idea conveyed to you that this band was to be self-sustaining or not?

A. Yes, it was my idea that it would have to be self-sustaining in order to work; that was my impression, and he also advised me that in order to make these bands it was necessary to soften them with chemicals.

Q. 13. Did he give you any idea as to how the band or ring was to be withdrawn from the matrix?

A. No, he did not; that was one of the points under discussion.

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Q. 14. What was your impression at the time?

A. That it could not be drawn from the matrix without spoiling the record.

Q. 15. When was it that you got this impression that we are just talking about from Mr. Lambert?

A. At our second interview—the fall of 1893.

Q. 16. Did you ever see a celluloid band as made by Mr. Lambert?



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A. I saw a part of one—not all of one—at the second meeting.

Q. 17. Did he give you any idea, either at your first or second meetings, as to how the matrix was made?

A. Yes, sir; he told me it was made by an electric process, which he did not explain.

Q. 18. Did you know at that time of what the electro-plating process consisted?

1210 A. Well, I had a general idea; that is very common, you know.

Q. 19. Did you know whether or not the wax record had to be electroplated preliminarily?

A. Yes, I knew that you could not get a wax record without being prepared with an electro-conducting substance.

Q. 20. Have you been interested in this subject-matter for some time—I mean in phonographs?

A. Yes, sir.

1211 Q. 21. And that is how, as I understand it, you entered into and became interested in Mr. Lambert's ideas?

A. That is correct.

Q. 22. Are you interested with Mr. Lambert in this matter at all financially?

A. No, sir.

1212 Q. 23. I now hand you a strip of material, and will ask you if you know what it is and whether you recognize it or not? (The strip referred to is the "Lambert Model 1893.")

A. Yes, it resembles the model I saw in 1893, only that the piece I then saw had paper on the back of it, and the indentations were much clearer on the one I saw than on this.

#### CROSS-EXAMINATION BY MR. DYER.

x-Q. 1. When Mr. Lambert talked with you at your second interview in the fall of 1893, did you under-

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stand that the celluloid band or strip was to receive impressions from the matrix?

A. Yes, sir.

x-Q. 2. Did he tell you how these impressions were made?

A. I do not remember the conversation, but I understood that it was pressed in, and I now call to mind that he softened with something—they were to be softened first and then pressed—I do not exactly remember now, but I had my own ideas, of course.

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x-Q. 3. Did he say how it was to be pressed into engagement with the matrix?

A. No, I think not.

x-Q. 4. Did you understand at that time that the celluloid strip or band was to first receive an impression from the matrix and then be mounted on papier mache before it received any impression from the matrix?

A. I have no idea of papier mache being used on the band; I remember it as paper on the back of the celluloid band or strip.

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x-Q. 5. Do I understand that in your conversations with Mr. Lambert in 1893 he did not describe the making of duplicate phonographic cylinders, but only described the duplication of phonographic records on long strips or bands?

A. No, sir; he spoke of both—both the making of cylinders and bands were discussed.

x-Q. 6. Did you see both the cylinders and strips or only the strips?

A. I saw only the strips.

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x-Q. 7. How long were the strips that you saw in 1893?

A. I should say probably six or seven inches long; I cannot remember the exact length.

x-Q. 8. Were these strips endless?

A. No, sir, they were not.

x-Q. 9. How did Mr. Lambert say that he received impressions upon these strips?

A. By pressing them into the matrix.



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x-Q. 10. And how did he say that he expected sound reproduction from them?

A. He expected to cement the ends of the strip together to make an endless band, and to use the endless band with an ordinary phonograph and reproducer.

x-Q. 11. How do you distinguish, then, the strips which Mr. Lambert expected to make into endless bands from the cylinders to which you also refer?

1218 A. The cylinders are circular and of sufficient strength to carry their own weight and position on the mandrel, while the band is simply a thin strip revolving on two rollers, as a belt turns on its pulleys.

x-Q. 12. Having reference now to the cylinders, did Mr. Lambert say in 1893 that impressions were to be received upon the cylinders having their ultimate thickness or were the impressions to be received upon a strip which was to be ultimately mounted upon some backing material?

1219 A. On that point Mr. Lambert was not thoroughly clear as to the results of either having a strip mounted on a supporting cylinder, or pressing a thin strip the width of the length of the matrix and then mounting on a support or backing; but he knew that the cylinder had to be self-sustaining in order to be a financial article. This was the thing that was put before me; I remember that very clearly.

1220 x-Q. 13. So far as your present recollection goes, the process described by Mr. Lambert to you in 1893 would include the engagement of a thin strip of celluloid with the matrix, and after an impression had been received thereon the winding of such a strip around a supporting cylinder, would it not?

A. No, that impression was not made on me. My understanding was that a strip sufficient in width and length should be used to fill the diameter and length of the matrix.

x-Q. 14. But the point I want to get at is whether or not it was definitely stated to you by Mr. Lambert that the supporting cylinder with the strip was used during the time the impression was taken, or was the

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strip subsequently mounted upon a supporting cylinder?

A. The strip was subsequently mounted on a supporting cylinder after the impressions were taken thereon.

x-Q. 15. And you say that when you saw Mr. Lambert in 1893 he only showed you a strip, and not a cylinder made of a strip carried on a support?

A. He only showed me a strip, and also a matrix, as I have already said.

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x-Q. 16. In reference to the manufacture of the matrix by an electrical process, did Mr. Lambert say why the wax record had to be first coated with metal?

A. No, he did not make any statement of that kind to me.

x-Q. 17. Did you understand that the wax cylinder had to be first coated with metal?

A. I would naturally know that by the philosophy of electricity.

Signature of witness waived. 1223

RICHARD E. HAMILTON, a witness produced, sworn and examined on behalf of Lambert, in answer to questions by Mr. Sheridan, deposes and says as follows:

Q. 1. Please state your name, age, residence and occupation.

A. Richard E. Hamilton; about thirty-five years; 1818 Arlington Place. I am a varnish maker.

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Q. 2. Are you acquainted with Mr. Thomas B. Lambert, one of the parties to this interference?

A. Yes, sir.

Q. 3. How long have you known Mr. Lambert?

A. About fifteen years.

Q. 4. State whether you have ever had any conversations with Mr. Lambert about phonographic records, and, if so, when for the first time.

A. Yes, sir, I have had a great many conversations with him; I think the first was somewhere in 1894, but am not sure.



- 1225 Q. 5. What did this conversation relate to?  
 A. It related to the production of an indestructible record of some material—without any definite material being given, I think—so that the record could be applied to commercial uses without having the inconvenience of a record that would break.
- Q. 6. Did you ever see him make any records, and if so, when and where?  
 A. Yes; I have; in September or October of 1897,  
 1226 at 67 Lake street, Chicago.
- Q. 7. What kind of a record was it he produced there which you saw?  
 A. The one that I saw him produce was a circular record made of a hard substance like celluloid; and he showed me at the same time other records of similar material, which I did not see him produce, but which he stated he had made.
- Q. 8. Were these records thin, so that they would collapse easily in the hand, or were they thick enough  
 1227 to be self-sustaining?  
 A. They were of varying thicknesses; some of them were thin, and his aim seemed to be to obtain material by which he could make them thick enough not to collapse.
- Q. 9. I now hand you a record marked "Exhibit Lambert's 1897 Matrix," and ask you if you have ever seen anything like it?  
 A. Yes, sir. I cannot tell whether it is the identical record, but it looks like one I saw Mr. Lambert make at 69 Lake street along some time in the fall of 1897.
- 1228 Q. 10. Did Mr. Lambert explain it to you, or show you the process by which this record was produced?  
 A. Yes; he did, in a general way. He may possibly have told me the entire process, but not being particularly interested therein, except in seeing Lambert get along, I do not think I can tell exactly what the process was. I remember, however, that he took a wax record and coated it with a powder like plumbago, and then he put the wax record with the plumbago into an ordinary electrolytic bath, and he had a storage battery and electroplated copper on to the plumbago.

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After he had deposited the copper to a certain thickness, he removed the whole thing from the bath and took the wax record out and left the copper shell. I think he then polished the inside of the copper shell with whiting in order to smooth it. He then put the matrix inside of a large brass ring and filled up the space between the matrix and the brass ring with plaster of Paris. He then took a sheet of celluloid, or a strip, and softened it by dipping it in hot water, brought the two ends together and cemented them so as to form a ring just a trifle smaller than the inside of his matrix. Then he dropped his ring into the matrix and filled up the cylindrical space in the inside of the celluloid ring with rubber or some similar material. I think that was his first trial. He then put them into a vise and squeezed the rubber longitudinally, the idea being to have the rubber expand the celluloid cylinder up against the matrix. Before that was done the celluloid was heated in hot water and softened. After it had been in the vise, as he thought, long enough to set it up—perhaps three, five or ten minutes—the vise was loosened and the rubber, celluloid and all put into cold water, when it could be pulled out by hand.

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Q. 11. I now hand you an exhibit in the case, and ask you if you recognize it, or if it reminds you of anything you have seen before?

A. Yes, sir; it reminds me of the matrix I have just tried to describe to you. (The matrix referred to here is that marked "Exhibit Lambert's 1897 Matrix.")

Q. 12. How do you fix the date as September or October, 1897, in your mind?

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A. From my own employment. In 1896 and for several years previous I had been engaged with my brother in the manufacture of cyclometers, and gave up the business in 1896, when I took a position with the Wagner Company as conductor. In 1897 I went to San Francisco and came back in August, and was put on a run between Deadwood and Chicago, and I met Mr. Lambert while making these runs to Deadwood, and persuaded him to take our old cyclometer shop.



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Q. 13. Did you have any talk with Mr. Lambert prior to the fall of 1897?

A. Yes, sir.

Q. 14. About how long prior to 1897 was this talk?

A. I will have to make a guess as to that; I should say two or perhaps three years prior to that.

Q. 15. Did he explain his process comprehensively to you at this early date?

A. No, sir; he did not.

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Q. 16. You knew, however, what he was working at, did you not?

A. Yes, sir.

Q. 17. What did you understand it to be?

A. Well, I understood it to be a phonographic cylinder which could not be broken.

Q. 18. Did you know anything of Mr. Lambert's financial condition at that time?

A. Yes, sir.

Q. 19. What was it?

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A. Well, he was what is commonly called "flat broke."

Q. 20. Was he ever able to pay all the rent for the shop you referred to?

A. No, sir.

CROSS-EXAMINATION BY MR. DYER:

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x-Q. 1. You say, Mr. Hamilton, in describing the process which Mr. Lambert carried out in your presence in the fall of 1897, that he took a sheet or strip of celluloid and made a ring out of it; what was the thickness of this sheet?

A. I do not know what the thickness was—they were very thin; about like a sheet of paper; perhaps a little heavier.

x-Q. 2. After the impression was made on this ring of sheet celluloid was the celluloid mounted on a backing?

A. Yes, sir.

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RE-DIRECT EXAMINATION BY MR. SHERIDAN :

Re-d. Q. 1. Do you mean by your last two answers to state that the celluloid ring which you saw formed, or was explained to you by this process, was so thin that it would not stand up ?

A. It is really impossible for me to tell you as to whether he formed the impression on the thin ring and then backed it up or backed it up first.

Re-d. Q. 2. The records you saw produced, however, 1238 were self-sustainable, were they not ?

A. Yes, sir.

Re-d. Q. 3. The record which I have shown you as an exhibit in the case is similar to or possibly one of those which you saw at that date ?

A. Yes, sir.

Signature of witness waived.

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STATE OF ILLINOIS, COOK COUNTY, SS.

I, Annie C. Courtenay, a Notary Public within and for the County of Cook and State of Illinois, do hereby certify that the foregoing depositions of Thomas B. Lambert, Vincent A. Taylor and Richard E. Hamilton were taken on behalf of Lambert, pursuant to stipulation by counsel, before me, at the office of Mr. Thomas F. Sheridan, 204 Dearborn street, in the City of Chicago, in said county, on the 5th and 6th days of 1240 February, 1901 ; that said witnesses were by me duly sworn before the commencement of their testimony ; that the testimony of said witnesses was written out by myself stenographically and afterwards reduced to typewriting ; that the opposing party, Thomas A. Edison, was represented by his counsel, Mr. Frank L. Dyer, during the taking of said testimony ; that said testimony was taken at the above-named place and was commenced at 10 o'clock on the 5th day of February, 1901, was continued pursuant to adjournment, and



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was concluded on the 6th day of said month; that the deposition of the said Lambert was read over by him before he signed the same—signature of the other two witnesses having been waived by consent of counsel; and that I am not connected by blood or marriage with either of said parties, nor interested directly or indirectly in the matter in controversy.

In testimony whereof I have hereunto set my hand and affixed my seal of office at Chicago, in said county,

1242 this 7th day of February, 1901.

[SEAL.]

ANNIE C. COURTENAY,  
Notary Public for Cook County.

## UNITED STATES PATENT OFFICE.

INTERFERENCE No. 20,534.

1243

THOMAS B. LAMBERT

vs.

THOMAS A. EDISON.

Record Cylinders  
for Phonographs  
and Methods of  
Producing the  
Same.

1244

Testimony in rebuttal taken on behalf of Lambert this 28th day of March, A. D. 1901, beginning at 10 o'clock A. M., before Annie C. Courtenay, Notary Public, at the offices of Thomas F. Sheridan, 204 Dearborn street, Chicago, Illinois, pursuant to stipulation by counsel.

Present: THOMAS F. SHERIDAN on behalf of Lambert, and FRANK L. DYER on behalf of Edison.

THOMAS B. LAMBERT, a witness produced, sworn and examined in his own behalf, in answer to questions by Mr. Sheridan, deposes and says as follows:

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Q. 1. Are you the same Thomas B. Lambert who has heretofore testified as a witness in this cause.

A. I am.

Q. 2. Since giving your previous testimony have you examined the file-wrapper and contents of the application of Mr. Edison in interference in this case?

A. I have.

Q. 3. Do you understand the process disclosed therein or not?

A. I think I understand what he means to disclose. 1246

Q. 4. Since giving your previous testimony, have you examined letters patent No. 526,147, granted to Thomas A. Edison, September 18, 1894, and do you understand the same?

A. I have, and believe I understand it.

Q. 5. Have you had any experience in reading patents?

A. Yes, sir; I have read a great many.

Q. 6. For what purpose did you read or examine letters patent? 1247

A. I have examined them in order to give my opinion as to their validity to others, and also in my own self interest?

Q. 7. Do you consider yourself competent to define and compare the structures disclosed in letters patent with concrete organized machines?

A. I consider myself able to do so.

Q. 8. Do you know anything about the price that is obtained for phonograms in the wholesale trade at the present time? 1248

A. I think so.

Q. 9. About what is the usual price?

A. The list price of wax phonograms is and has been for some time fifty cents each. Dealers and wholesalers, I understand, to be allowed from forty to fifty per cent. discount, and in some cases even more. I am referring now to the standard phonograph record.

Q. 10. At about what price does the company with which you are connected sell its phonograms?



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Counsel for Edison objects to the question and to previous questions and answers, on the ground that they are not proper rebuttal testimony; and, in order that this objection may not have to be repeated, he wishes it understood as applying to all future questions and answers of a similar character.

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In order that there may be no misunderstanding as to the kind of testimony that is now being taken on behalf of Lambert, counsel for Lambert will here state that Edison has not shown that he has a practical process, or that his phonograms have entered at all into practical use, or that he has made a practical disclosure thereof; and this testimony is taken to lay the foundation to establish such facts, and also to demonstrate that Lambert is making and placing on the market a practical record which meets all practical requirements, while Edison's disclosures are impracticable and his process inoperative.

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In response to the statement of counsel for Lambert, counsel for Edison states that the question of the practicability of an invention is not determinable by interference proceedings, and that the question of inoperativeness is entirely an interlocutory matter, for which the rules provide proper motions at the proper times.

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A. The Lambert Company's records are listed at fifty cents each, and wholesale dealers are allowed from thirty to forty per cent. discount; rarely, if ever, more.

Q. 11. With what success are the records made under your process meeting?

A. We have had very few objections raised against them; and we have spent practically nothing in advertising, excepting a few letters which were sent to a number of dealers, who are taking care of the output of our present factory. We have not advertised more,

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because with our present facilities we cannot take care of more orders than we now have.

Q. 12. About how many records do you think have been placed on the market as made by you?

A. This can only be an estimate, as I have not kept the books, nor have I been present at the factory all of the time, but, in my judgment, I should say that there have been about seventy-five thousand made.

Q. 13. About what is the output per day when you are running full force?

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A. From 450 to 500 per day; of course, that means more or less.

Q. 14. What has been your idea all along of your invention; was it merely to reproduce phonograms, or to reproduce a phonogram of any particular kind? In answering this question you can give as long and detailed an explanation as you please, leading up to the point where you succeeded in making a permanent record.

A. It has always been my idea that nothing is a record unless it is to a greater or less extent permanent, whether phonographically or otherwise. A great many years ago Scott's phonautograph was invented, which instrument recorded sounds, but did not reproduce them. For a long period after this it was a laboratory experiment to record sounds on cylinders which had been coated with lampblack. These records were sinuous lines on the lampblack surface of the cylinder. This constituted a phonographic record, but it was not reproducible.

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The next step along this line was the invention and production by Mr. Edison of the tin-foil phonograph record, which not only recorded the sound waves, but enabled one to reproduce them a very limited number of times.

The next step in this line was the development of the wax or wax-like cylinder, on the surface of which sound waves were recorded, and from these sound waves could be reproduced a very much greater number of times than with the tin-foil. This more nearly



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approached my idea of a record, inasmuch as it could be kept and reproduced under certain conditions; but, as before stated, I have never considered a record worthy of the name record until it became permanent to a much greater extent, to say the least, than the tin-foil or wax records are or have been. It was to the production of such a record—one that would be permanent in its character—that my work tended, and that was the object I sought to attain.

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Q. 15. In comparing the sound produced by these wax-like records and your celluloid records I have noticed that there is a trifle harsher sound in the reproduction of the record from the celluloid than is reproduced by the wax; will you kindly explain this?

A. An examination of the surface of a wax cylinder will generally show that instead of being perfectly smooth it has microscopic elevations and depressions which if a stylus in reproducing should follow—that is, should faithfully follow these minute indentations and

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elevations—a very much greater noise or scratchiness would be observed in the reproduction of the record than occurs upon trial. The reason that these extraneous sounds are not produced in the reproduction of the record is that this minute roughened surface of the wax itself succumbs under the weight of the stylus and diaphragm, so that instead of the wax causing the diaphragm proper to faithfully vibrate in accordance with the microscopic surface of the wax record it depresses these elevations, and the result is an apparent smooth-

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ness of record—in other words, it follows an average line of the sinuous record groove. Now if we were able to take a wax record comparatively free from extraneous noise and harden it without in any way affecting its surface, it is my opinion that the extraneous noises resulting from such a hardened record would be much greater than the extraneous noise produced from the reproduction of celluloid records made by the Lambert Company from the same records. The reasons for this I believe to be as follows:

Supposing, first, that we make a matrix in absolute



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fidelity to the original wax record, including its microscopic roughness of surface, and we place on the inside of this matrix a celluloid phonogram blank softened and extended outwardly, the pressure necessary to reproduce the indentations of the matrix upon the phonogram blank is not sufficient of itself to reproduce the microscopic roughness, the tenacity of the surface of the phonogram blank being sufficient to prevent its following into the microscopical roughness but only allowing it to form the general contour of the sinuous grooves of the matrix. Thus by our process we are enabled to use a matrix which in itself may perhaps have a much rougher surface than the resultant product.

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Q. 16. What life do you estimate a celluloid record as made by your process will have?

A. I have reproduced one record at least 5,000 times, and have failed to detect any appreciable change therein whatsoever; and I am free to state that I think it will stand not 5,000 but 25,000 without sensible diminution of quality or loudness.

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Q. 17. How about the comparative value of wax and celluloid records as regards breakage by dropping on the floor or through the mails?

A. The ordinary wax records standing upon a table if tipped over are almost invariably broken. They cannot be dropped upon the floor ordinary distances—such as would occur in handling—without being obliterated and certainly destroying the record. Any slight changes of which they are susceptible would practically destroy the efficiency of the record.

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With the celluloid records, on the contrary, I have demonstrated their indestructibility to customers by using a base-ball bat to drive them across the room up against a brick wall, and have then placed them on the machine and reproduced them in apparently as perfect condition as before.

Q. 18. I would like to ask you, then, whether you would consider the production of a wax record by your process a new result or an old one; and



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whether you would consider the production of the celluloid record a new result or an old one ?

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A. Since my early experiments with the matrices I have often made wax records therefrom under our process as a test of the matrix in comparison with the master record from which it is made ; and in no sense did I consider the wax records made under this process as differing in any way from those produced by other processes. A celluloid record, on the contrary, produced under this process—or any other process—is a new article of manufacture that has been long sought after ; by this I mean to imply that the indestructibility of the record had been long sought after.

Q. 19. Have you ever seen a celluloid record produced by any other process other than your own ?

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A. I had not up to the time of my invention ; but I have recently seen a record which was the result of direct engraving upon celluloid previously softened with a solvent. I may add that this record was not either practical or commercial in the state in which I saw it, the two sides of the cylinder being entirely different.

Q. 20. Have you read the testimony given by Mr. Edison and Mr. Wurth in this interference ?

A. Yes, sir ; I have.

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Q. 21. Mr. Edison and Mr. Wurth both testify—and it is also stated in Mr. Edison's specification—that a deposit of carbon or graphite on the wax master record could not be used successfully. Will you be kind enough to give your explanation of why they possibly met with failure along this line ?

A. In the first place, they may not have used graphite of the right character ; secondly, they may not have used master blanks of the right character ; and, lastly, they may not have used the proper care and attention in the electrolytic deposition thereon. An impure or coarse graphite might produce a very rough matrix under the process referred to ; a record blank might have a chemical action in the electrolytic bath which would tend to produce a rough matrix ; and a failure

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to attend to the details of the electrolytic deposit might vitiate all the care of previous conditions. The neglect of any one of these points might be fatal to good results. A reasonably smooth matrix is of course a necessary condition. Supposing all of these conditions to be carefully looked after, the grains or particles of the graphite are of an appreciable size, and the electrolytic deposit following the graphited surface of the wax would also follow very minutely the small crystals of graphite that are adhering to the surface. A matrix made under such a process—that is, the use of a graphited surface electrolytically covered with copper or similar material—used for the reproduction of a wax record, in the manner that I understand to be described by Edison, would necessarily have all the imperfections of the matrix caused by coarse graphite, the chemical action of the blank on the electrolytic solution, or faulty deposition if it existed; whereas, a celluloid blank being placed in such a matrix and outwardly expanded against it could not so faithfully follow this microscopically rough surface as to perfectly bring out the microscopical irregularities, but will only follow the general undulatory form of the matrix.

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Q. 22. You state that you have read the file-wrapper and contents of the Edison application in this interference; now I will ask you if the process described therein is sufficiently clear or would give you sufficient information to enable you to make celluloid records therefrom?

A. I don't think it would.

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Q. 23. On what is your conclusion based; please give your reasons fully?

A. If his process, as I understand it, were followed out, with the exception of using a celluloid blank instead of a wax blank, the result would be that the entire body of the celluloid blank would become plastic by conduction of heat, the interior of the blank becoming soft at an early stage and not furnishing sufficient expansive backing to force the blank outwardly and cause an imprint to be made upon its surface from the



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matrix. With wax, however, the coefficient of the expansion being much greater than that of the matrix, the combination of matrix and wax blank on the interior may be gradually raised to a determined temperature, so that the greater expansion of the wax blank will in some cases give the desired result. The expansion of the celluloid blank under like conditions will not produce the desired results.

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Q. 24. Mr. Wurth, the same witness who testified in Edison's behalf, in an affidavit dated the 29th day of August, 1898, which affidavit is in the file-wrapper of the Edison application now before you, says :

"In carrying out the Edison process, I usually heat the blank after it has been inserted in the mold to a temperature of about 115 degrees Fahrenheit ; but this, of course, depends largely upon the character of the material of which the blank is made. This heating does not in any way affect the brittleness of the blank, nor does it make the blank plastic."

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Would such a heat as that, or anywhere near that point, soften a celluloid blank sufficiently to enable it to be displaced by a mandrel to obtain the impressions from a matrix ?

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A. No ordinary pressure would produce those results. Were the blank confined in a matrix of sufficient strength, perhaps an extremely heavy hydrostatic pressure would bring this about, due to the fact that the high pressure would raise the temperature ; but by the process disclosed in the application the results could not be brought about.

Q. 25. Mr. Wurth, in the same affidavit, also says :

"The blank phonogram on which the record is to be impressed is then inserted in the mold, being fitted therein as closely as possible. \* \* \* The mold having the blank therein is then subjected to a rise in temperature, so as to expand

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the blank, without, however, making it plastic or destroying its friability."

Would such an explanation enable you to make a celluloid phonogram or not?

A. It would not, and for this reason: The outer surface of the phonogram blank designed to come in contact with the matrix and receive impressions therefrom would have to be softer than any such temperature as referred to would make it, and if the expansive force of the blank alone was to be used the interior portion thereof would have to be rigid enough to exert a pressure sufficient to produce the results, which pressure would necessarily be a function of the degree of softness of the surface. A preliminary softening of the outer surface under those conditions might enable the desired results to be obtained, but the description does not disclose the idea of preliminary softening of the surface being a necessary step.

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Q. 26. Then is it your idea or not that something further might be done to produce celluloid records than is disclosed in the Edison specification?

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A. I do not think that the specification discloses a process that would enable anyone to make merchantable celluloid records; some further investigation and experiments would be necessary in order to successfully make such a record.

Q. 27. Do you know anything about the vacuous deposit spoken of by Mr. Edison in the specification and particularly referred to in the specification of his patent No. 526,147 hereinbefore referred to?

1280

A. I have read the patent, and am more or less familiar with the process disclosed therein.

Q. 28. Is it an economical or an expensive process?

A. I should consider the process too expensive for use in connection with the manufacture of phonograph records.

Q. 29. Does patent No. 526,147 to Edison—to which he refers in his application in this interference—say



1281

anything at all about phonograms or phonograph records?

A. It does not.

Q. 30. Does it disclose how a phonograph record could be coated?

A. I do not think a phonograph record could be coated by that process as disclosed in the patent without further information being afforded.

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Q. 31. Does it say anything about celluloid records?

A. It does not.

Q. 32. I will now ask you, if you should take the application of Mr. Edison in this interference and his patent and read them both together, whether or not they would disclose how a celluloid record could be made, as disclosed by your patent?

A. In my opinion they do not.

Q. 33. Have you any of the records with you made by your process?

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A. I have, and here produce them.

Counsel for Lambert offers in evidence the records referred to by the witness, and requests the Notary to mark them "Lambert Exhibit Record No. 288," and "Lambert Exhibit Record No. 465."

CROSS-EXAMINATION BY MR. DYER:

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x-Q. 1. How long have you been making the celluloid records you refer to—I mean the 75,000 you claim to have made and sold?

A. Since some time in the summer of 1900. We began to put them on the market then.

x-Q. 2. What has been the average daily output of your factory since it started?

A. This will have to be another estimate, but I should think from two to three hundred—perhaps more. We often run over 500. Some days the factory has been closed down entirely on account of making changes in the machinery.

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x-Q. 3. Would from two to three hundred per day be, in your opinion, a fair average at that time?

A. Yes, I should think it would, without taking pains to figure closely. I do not actually look after the books, and without reference to them could not state positively.

x-Q. 4. As I understand your argument, you express the opinion that the reason the ordinary wax records are smooth and relatively free from scratchiness is that the reproducer serves to iron out, so to speak, the microscopic roughness which you believe to be inherent in all material; is that correct?

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A. That is substantially correct.

x-Q. 5. Did you ever examine a wax record before and after reproduction with a microscope to determine whether such in fact is the case?

A. I have, but that might not fully explain the conditions. I do not think that the stylus will necessarily permanently iron out, as it were, the minute inequalities, but that these inequalities succumb under the weight of the stylus and to a certain extent are flattened, as we know that a wax record is gradually obliterated.

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x-Q. 6. And I understand your second assumption is that if the wax record after being made were hardened, these microscopic inequalities would not be ironed out, and that therefore the reproduction would be rough; is that correct?

A. It would be rougher than it is in the wax—probably rougher than we now get from the celluloid reproduction.

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x-Q. 7. As I understand it, the reason celluloid records are not so scratchy as a very hard wax record would be is that the celluloid, by reason of its surface tenacity, is not impressed into the very fine or microscopic inequalities of the matrix, but only follows the general outline of the record surface of the matrix; is that correct?

A. That is substantially correct.

x-Q. 8. So that in the making of your records you



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have not so much sought to make any absolutely faithful copy of a master as to make a more or less general reproduction; or, in other words, to make a copy which follows the master only in a general sense, and not in its specific details.

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A. I have sought to make a copy in celluloid that will faithfully follow the sound waves, but not follow the mechanical faults of the surface. I have even attempted to remedy this at different times by the use of a film of oil, which I at the time supposed could be forced, as it were, into these minute cavities to further aid in producing a better surface. I found that by putting too much oil I could in some instances get scarcely any kind of impression. A proper amount of oil in cases of exceptionally rough matrices materially benefited the resultant phonogram.

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Q. 9. But do I understand that the celluloid copies you made are absolutely faithful, so far as the phonograph record itself is concerned?

A. I mean to say that I think the ear could not detect any difference.

x-Q. 10. Did you ever compare one of your copies with the master from which it was made to determine whether the ear could detect any difference between them?

A. I have, very often.

x-Q. 11. And you found that the ear could not detect any difference between the record and master?

1292

A. I found that the copy produced in celluloid was louder than the master from which it was made. I found that it apparently lost none of its tone qualities; and I also found at times some difficulty in obtaining a surface perfectly free from extraneous noise.

x-Q. 12. But did you find the quality was as good?

A. Yes; I have so stated.

x-Q. 13. You state that you have operated a celluloid record 5,000 times, and that you believe the same record could have been operated 25,000 times without sensible deterioration. Would the ordinary

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purchaser operate a record 5,000 times or 25,000 times?

A. The majority of purchasers would not.

x-Q. 14. It seems to me that your examination in chief is designed to give the impression that the important point of your invention is the making of a celluloid record; that you look upon a celluloid record as a new thing; and that you claim it to be a new article first used by you; is that correct?

A. First successfully used by me; that is the only correction I would make. 1294

x-Q. 15. Are you familiar with the Young process for making celluloid records?

A. I have read the patent.

x-Q. 16. Did you have that process in mind when you gave your deposition?

A. I did.

x-Q. 17. Does the Young patent describe a process for making celluloid records?

A. I do not consider it to be operative. 1295

x-Q. 18. But it describes a process for making records?

A. Yes, sir; it does, and I saw them.

x-Q. 19. And the Young patent was taken out before you made your invention, was it not?

A. Yes, sir.

x-Q. 20. Do you make the same answers with reference to the Lioret patent?

A. Yes, with the exception—if one can use a comparative term—that it is even more inoperative than the process described in the Young patent. 1296

x-Q. 21. Do you find that the issue in this interference states that the process is carried out in connection with celluloid?

A. It does not specifically say anything about celluloid.

x-Q. 22. You state that you have made wax records by this process. I infer that the process is the same in a general sense, whether the records are made of one material or another?



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A. In stating that I made wax records by this process, I did not mean that at any time I have softened the exterior surface of the wax record before putting it in the matrix. I mean that I have put it in a matrix and raised its temperature in the manner described by Mr. Edison.

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x-Q. 23. I wish you would look over your patent, Mr. Lambert, and point out to me where any reference to celluloid is made.

A. I used the term "cellulose," believing it at the time to be a generic term indicating celluloid, celluloid being only a composition of cellulose being the sense in which I used it—vulcanized rubber acts similarly.

x-Q. 24. Your patent, then, simply refers to cellulose as a generic term, and not to a particular kind of celluloid known as cellulose?

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A. That is true, but in my experiments I was using celluloid.

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x-Q. 25. The Century Dictionary and Cyclopedia defines cellulose to be "the essential constituent of the primary wall membrane of all cells, a secretion from the contained protoplasm, isomeric with starch in its composition, and allied to starch, sugar, and inulin." The same authority stated that "cotton and the bleached fiber of flax and hemp are nearly pure cellulose, and in some filter paper it is almost chemically pure." Again, it is stated that "cellulose is also said to exist in the tunics of the Ascidia and in other invertebrates." I presume you agree with these statements.

A. I agree with them so far as I know.

x-Q. 26. Would it be possible to carry out your process with cotton and bleached fiber, flax or hemp as the materials for making the duplicates?

A. Untreated or uncombined with other materials, I do not think it would.

x-Q. 27. So that a person reading your patent could not carry the process out with all forms of cellulose,

1301

but would have to make an independent investigation to determine what kind of cellulose was to be used?

A. In the first place, the specification points out the infrangibility of the record at a particular point. It compares the term "cellulose" directly with vulcanized rubber, which is in itself a perfect suggestion to anyone familiar with vulcanized rubber that cellulose would naturally mean a similar or analogous compound; and any one attempting to use the dictionary definition of the word cellulose in comparison with this patent I now see would readily turn to the celluloid composition which is compared with and very similar in action to vulcanized rubber. The form of cellulose referred to in the dictionary definition could not in any sense be called durable or infrangible, as required by the specification of the patent.

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x-Q. 28. You compare celluloid with vulcanized rubber; in what respects do the two resemble each other?

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A. In many cases they look very much alike. They become plastic under very near the same treatment and I should say at about the same coefficient of expansion, and are of about the same relative hardness.

x-Q. 29. Now you say that since your patent refers to vulcanized rubber and cellulose a person would seek that form of cellulose which more nearly resembles vulcanized rubber, which you state to be celluloid. The same dictionary from which I have previously quoted in defining the word "celluloid" states that it is "A substance made of guncotton, camphor and some other ingredients." Would you call such a substance or mixture of ingredients cellulose?

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A. Cellulose treated with nitric acid and made plastic with camphor is now what I know as celluloid.

x-Q. 30. But is it not a fact that the instructions of the patent, referring to "a soft ring of cellulose," cannot be carried out and that the process as you now



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carry it out is carried out in connection with a material of which cellulose forms only one of the ingredients?

A. As before stated, since the issuance of the patent I have found that I have misused the word cellulose according to its dictionary definition, and that what I meant was celluloid.

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x-Q. 31. You state as possible reasons for the opinions expressed by Mr. Edison and Mr. Wurth that the use of graphite in connection with the making of the matrices is not desirable; that the graphite particles produce the roughnesses in matrices which are copied by the wax but not by the celluloid; is that correct?

A. That may be one of the reasons.

x-Q. 32. I understand that you use graphite?

A. Yes, sir; I do.

x-Q. 33. How large are the graphite particles?

A. I cannot say how large they are; I never measured them.

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x-Q. 34. Have you any idea of the size of the particles?

A. I cannot say that I have, to speak in actual measurements.

x-Q. 35. What is the pitch of a phonograph record?

A. One one-hundredth of an inch.

x-Q. 36. So that the maximum width allowed for a record groove without overlapping is obviously one one-hundredth of an inch?

A. Yes, sir.

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x-Q. 37. Do you know the diameter of the standard recording tool?

A. I use them differently. I use from about forty-five to fifty-one thousandths.

x-Q. 38. Assuming a recording device to be forty-five thousandths of an inch in diameter cutting in a record groove one one-hundredth of an inch in width what would be the depth of the groove?

A. I find that it is approximately one one-thousandth of an inch—that is, without overlapping.

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portions of the record groove that are very much less in width than one one-hundredth of an inch, and do not these portions appear as merely slight dips below the surface, so to speak?

A. Yes, sir, I do in many instances.

x-Q. 40. So that there are portions of the record which are probably considerably less than one one-thousandth of an inch in depth?

A. Yes, sir.

x-Q. 41. Now, in order that a matrix can be made which will copy the record faithfully, the entire surface of the original master must be covered with the graphite; this is so, is it not?

A. Yes, sir, this is so.

x-Q. 42. How many particles thick is graphite?

A. I am unable to state.

x-Q. 43. But do you believe it would be possible for particles of appreciable thickness to so carefully coat a record groove, the depth of which is less than one one-thousandth of an inch, that the matrix produced therefrom will be a faithful copy of such record groove?

A. Yes, sir, I know it is. Any number of vibrations per second constitute a certain pitch or tone, whether they be produced by the vibration of string, the vibration of a column of air or a siren. Any regular series of waves on a phonographic cylinder which in rotation causes the diaphragm to vibrate and the pulsations of air to issue at a known rate, gives a definite pitch, but this does not necessarily represent any special quality—for instance, the tone of a cornet differs from that of a violin, though the pitch or number of vibrations per second may be the same in both instances for a corresponding note. There are some auxiliary waves—sometimes called quality waves or timbre waves—that enable the ear to distinguish between two instruments sounding the same pitch. Not only will the covering of a wax record by graphite and coating it electrolytically enable us to reproduce the pitch of the instrument, but it will also enable us to

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reproduce their tone and quality, which represents an even finer series of waves than the pitch, for the tone wave is apparently minute waves upon the surface of the larger waves.

x-Q. 44. During the prosecution of his application, Mr. Edison, in a letter dated July 6, 1898, addressed to the Commissioner of Patents, said :

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" The use of plumbago for coating an original record, prior to electroplating the same, is possible only in the making of the roughest kind of duplicates, and applicant does not consider that such a process would result in the making of commercially acceptable blanks. The finest of plumbago particles obtainable on the market are invariably larger than the indentations of the record resulting from the aspirates or overtones, and such tones therefore give nothing but a rushing or scratching sound."

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Do you find anything of this kind in your experiments ?

A. I had little trouble of this kind, presumably because I took pains to burnish the record after being coated, the result being that the very coarse particles fell off and the finer particles were smoothened out or burnished into the surface.

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x-Q. 45. If you had not burnished the records after they were coated, would the matrix, in your opinion, have been a correct copy of the master ?

A. It would have been a copy, but perhaps somewhat rough, depending upon the fineness of the graphite groove.

x-Q. 46. Assuming that the matrix was made without first burnishing the record, would the records produced therefrom be commercially acceptable, in your opinion ?

A. I think they would, and the facts of the case are that they are commercially acceptable, because for a time I used matrices used that way.

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x-Q. 47. Then why did you adopt the expedient of burnishing the records?

A. As a minor improvement, adding nothing to the expense.

x-Q. 48. I understand that you consider the description of the Edison process as being inoperative—not in connection with the manufacture of wax records, but in connection with the manufacture of celluloid records, for the reason that in the manufacture of celluloid records it is necessary to heat or soften only the outer surface of the celluloid blank, and that therefore the Edison process, which refers to the heating of the mold and blank as a whole, would not be practically available for celluloid. Have I correctly stated your position?

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A. Yes, sir, you have.

x-Q. 49. In other words, you find, as I understand it, that in the manufacture of celluloid records it is strictly necessary in order to form the record waves to apply the heat to the outer surface of the celluloid blank alone; is this correct?

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A. No, sir, this is not necessarily correct. It is desirable to have the heat applied to the surface in order that the surface may be formed in connection with the matrix. Sometimes this has been done by heating from the interior and outwardly expanding the resultant mass and cooling it or allowing it to cool while under expansion, but in the case of putting the celluloid blank in the matrix and subjecting the entire thing to heat without pressure from the interior outwardly expanding it—depending on the expanding force of the blank alone—I do not believe it possible to make commercial records.

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x-Q. 50. But I understand that you find that in the manufacture of celluloid records by the use of heat alone, the heat must be communicated to the surface of the blank; that in the manufacture of celluloid records by heat and pressure, the heat may be applied to the entire blank; that in the manufacture of wax records by heat alone, the heat may be applied to the entire blank or to the outer surface thereof; and that



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in the manufacture of wax records by heat and an expansive pressure the heat may be applied to the entire blank or to the surface thereof. Is this correct?

A. I do not think it practicable to make wax records by putting them in a matrix and communicating the heat to the surface alone; otherwise the statement is correct.

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x-Q. 51. Do you not find that Edison in his application in interference refers to the employment of a plunger or expanding mandrel for forcing the blank into engagement with the matrix?

A. It is in the application.

x-Q. 52. Suppose we attempt to make a celluloid record by the process Edison describes and introduce a closely fitting blank in the matrix, subject the matrix and blank to heat, and finally force into the blank an expanding plunger or mandrel; would not such process be entirely practicable with celluloid?

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A. I doubt if those conditions alone would produce commercial records.

x-Q. 53. Why not?

A. In the first place, the mandrel would have to be heated to the same temperature; otherwise the heat applied to the blank would conduct from the record to the mandrel, lessening its plasticity to some extent; and, again, if sufficient heat were given to the blank to make a record under such conditions, it would probably take fire spontaneously. I have tried such method in connection with boiling water and have never succeeded

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in making records with perfect success therefrom.

x-Q. 54. Having regard to your first criticism, suppose immediately after the blank is inserted in the matrix the taper mandrel is inserted in the blank, and the matrix, blank and mandrel are all three subjected to the same temperature; would there be any conduction of heat in that case from the blank to the mandrel?

A. Not that I know.

x-Q. 55. In reference to your second criticism, please

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explain why in the assumed case the celluloid record would take fire spontaneously.

A. The blank would have to be heated sufficiently to produce a plasticity enabling it to be forced by the pressure into the form of the matrix. With the experience that I have had I should say that the heat necessary to produce this condition would at the same time produce spontaneous combustion, especially at points where the celluloid was in contact with the atmosphere.

1326

x-Q. 56. Does celluloid take fire spontaneously at a temperature approximating that at which it becomes sufficiently plastic to receive an impression?

A. I should say it takes fire or disintegrates when in contact with the atmosphere at certain temperatures.

x-Q. 57. What do you mean by "disintegrates" as you use that word?

A. The camphor or solid solvents seem to vaporize very rapidly, leaving behind the cellulose or peroxide, as a spongy material.

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x-Q. 58. If, then, in your opinion, it is impracticable to make a celluloid record from a matrix by applying heat to the matrix and blank and then expanding the blank how do you thus prevent the disintegration of the record under the conditions of your process as you carry it out?

A. It is always confined or protected by steam, which we use for heating; and I have also found that long exposure at too high a temperature would likewise produce a disintegration, but the presence of the steam prevents spontaneous combustion.

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x-Q. 59. In other words, as I now understand your position, the only criticism which you make to the Edison process as applied to celluloid is that Edison makes no provision for protecting the records from the effects of disintegration; is this correct?

A. I wish to say that I have never succeeded in making good musical records by the means under discussion, although I have faithfully tried to do so, and my experiments have led me to the conclusion that



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such a method is commercially impracticable, for the reasons before stated.

x-Q. 60. But have I not correctly defined your position in my last question?

A. In using the steam, he will have to do away with the use of a mandrel; and I use the steam for three purposes: first, for heating; second, for expanding; and third, to prevent disintegration or spontaneous combustion.

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x-Q. 61. Then, as I understand it, the trouble with the Edison process is (1) that he does not show any means for protecting the celluloid against spontaneous combustion or disintegration; and (2) that he uses a mandrel which would prevent him from using such means, even if he attempted to do so. Is this correct?

A. Understanding that it is necessary to raise the celluloid to a temperature producing sufficient plasticity, which at the same time approximates the temperature of disintegration, you are substantially correct.

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x-Q. 62. And you find that in carrying out your process there must be some provision made for preventing disintegration of the record during the time that it is subjected to the heat by which it is softened?

A. Yes, sir, I do.

x-Q. 63. I wish you would examine your patent, Mr. Lambert, and point out any statement therein to the effect that during the time the heating is applied provision must be made for preventing disintegration of the record.

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A. At the time the application for this patent was made I was making records for advertising purposes, consisting of talking or shouting records, and these records while good and sufficient for advertising purposes, were not phonographically perfect, as judged by the critics of the standard record. They lost much of their quality and detail, but not enough to prevent or interfere with their advertising value, which consisted largely in understanding the words, and not in the quality thereof. The process described in the patent was a generic process, not intended to show specific means



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or cover general minor improvements of detail. The process contemplated the preliminary softening of the outer surface of the blank, by using solvents or the like, and did not contemplate the use of heat or steam at all. By this preliminary softening no disintegration takes place and there is no danger of spontaneous combustion, the blank becomes plastic and the mandrel is forced out, but to make it plastic by the application of heat these conditions arise.

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x-Q. 64. In describing your process, I was under the impression that you were describing the process of the patent, because the patent is the only thing with which we are here dealing; and I am afraid that we have made very little progress. You criticise the Edison application as describing an inoperative process, and I have been trying to find out how the Edison process is any more deficient than the process shown in your patent. Your answers have evidently been directed to something outside of the patent; let us bear that in mind when considering all future questions. Your patent states that "this relatively thick ring or tube is then placed within the cylindrical opening of the matrix, and, by means of an expansive pressure with heat, forced outwardly." Now in what respect is this a more complete exposition of the process applied to celluloid than that which Mr. Edison has made in his application? In your answer please refer only to the patent and not to what has been done by you after the patent was applied for.

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By MR. SHERIDAN: Counsel for Lambert states that he has always taken the ground that the description in the Edison specification, so far as it could possibly relate to celluloid records, was defective and the process inoperative, in that it did not describe a process by which celluloid records could be made, and the contention was based on the ground that heat alone could not be used to accomplish this result; that the ring must be preliminarily softened before it is



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placed in the record, and to this end Mr. Lambert's patent is limited. The quotation by counsel for Edison is only a part of the process. The preceding step includes the idea of taking a soft ring of cellulose or rubber.

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By MR. DYER: Counsel for Edison, in reply to the statement just made, suggests that the scope of the claim has already been determined by the Patent Office, it having been decided by the Examiner that, generically considered, the Edison process is the same as that of the patent involved in this interference. It seems desirable that the distinction which the Office has applied to the claim should be followed by counsel.

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A. The reason why the process, so far as celluloid is concerned, in the Edison application is impracticable is that he does not preliminarily soften his ring, consequently in using expansive force with heat, a high degree of heat has to be used, which tends to disintegrate the celluloid or create spontaneous combustion. In my patent I contemplate and do preliminarily soften the celluloid ring, so that in expanding the same but low degrees of heat are necessary—degrees of heat that do not in any way, chemically or otherwise, affect the softened ring.

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x-Q. 65. I understand, then, that in carrying out the process with celluloid the celluloid must either be first softened with a solvent so that but low heat will be necessary in or during the expansive operation; or else, if it is not softened preliminarily by a solvent, provision must be made for protecting the celluloid from spontaneous combustion or disintegration. Is that correct?

A. That is correct.

x-Q. 66. This would not be the case, however, with ordinary phonographic record materials, viz., the usual insoluble metallic soap, or so-called wax-like material, would it? I mean those made with the usual metallic soap or so-called wax-like records.

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A. In my experiments I have never found it necessary, nor do I think it necessary, to preliminarily soften the surface of the wax records.

x-Q. 67. But, so far as these wax-like records are concerned, they can be made by merely outwardly expanding under pressure any matrix and cylinder or tube of softened material sufficiently thick to maintain its shape; and by "softened" I mean of sufficient plasticity to take an impression, effected by heating the blank in the matrix or in any other way?

1342

A. I believe that possible.

x-Q. 68. Did you ever make records from chalk?

A. No, sir, not directly from chalk.

x-Q. 69. Or from slack lime?

A. No, sir.

x-Q. 70. Or from lampblack?

A. No, sir.

x-Q. 71. Or from waxes or resins as such?

A. Yes, sir.

1343

x-Q. 72. With references to the making of records from waxes or resins, they can be made by heating the blank after it has been made in the matrix, can they not?

A. If their coefficient expansion sufficiently exceeds that of the matrix, they can.

x-Q. 73. What effect would there be on the process if the wax or resin had the same coefficient as an expanding mandrel?

A. It would be forced into the indentations of the matrix, and could not then be removed without injury to the record.

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x-Q. 74. Could it not be removed if the record, after being made, were alone subjected to cold?

A. Perhaps it could, if the record alone were cooled and not the matrix; but, being in contact with the matrix, that would be a difficult proposition.

x-Q. 75. Did you ever make any records of sealing wax or shellac mixed with fine precipitates, like chalk?

A. I have.

x-Q. 76. In the making of these records, did you find



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it necessary to first preliminarily soften, or could the records be made as Edison describes ?

A. I could not remove them, but used split records, cementing the edges together thereafter.

1346 x-Q. 77. You have referred to Mr. Edison's patent No. 526,147 and stated that this patent makes no reference to the manufacture of matrices from phonographic master records. Did you ever examine the Edison patent No. 484,582, dated October 18, 1892, or more than two years previous to the date of that patent ?

A. I may have, but do not now remember it.

1347 x-Q. 78. You will note that the Edison patent No. 484,582 refers to application No. 118,942, and that said application No. 118,942 issued as patent No. 526,147. At the time patent No. 526,147 issued, patent No. 484,582 had been running almost two years. Taking the Edison patents Nos. 546,147 and 484,582 together, do not these patents make entirely clear the process of making matrices by an electro vacuum deposit process ?

A. In patent No. 484,582 Mr. Edison describes a process of coating a phonogram in a vacuum by an electro vacuum deposit process, which apparently describes the method he intended to use.

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Counsel for Edison calls attention to the fact that effort has been made to have the issue construed in a different sense from that in which it has been construed by the Examiner and on appeal to the Commissioner. This might and probably should have been done on Lambert's *prima facie* case. Counsel for Edison will, therefore, confer with his client and may, at a later date, make a motion to have a time set for the taking of surrebuttal testimony, of which due notice will be given to counsel for Lambert.

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RE-DIRECT EXAMINATION BY MR. SHERIDAN :

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Re-d. Q. 1. Is it true or not that the process as described in the issue in interference can be used for making wax and celluloid records ; or, in other words, can records of both such materials be made by the same process ? Please give your reasons for any opinions you may express.

A. I do not think the process equally applicable to both cases. I have found it necessary to previously soften the surface of the celluloid blank to some extent, while I do not see how this can be done in using wax. 1350

Re-d. Q. 2. Is it true or not that the duplication of a wax-like cylindrical phonogram requires one process and the duplication of a cylinder of celluloid or vulcanized rubber requires another process ?

A. I believe that both require different processes.

RE-CROSS-EXAMINATION BY MR. DYER :

1351

Re-x-Q. 1. Let us admit that a process for making wax-like duplicates differs specifically from a process for making celluloid duplicates, in that in the making of celluloid duplicates the blank should be softened with a solvent, whereas in the making of the wax-like duplicates the blank is softened by heat, but are not the two processes generically the same, in that in both of them a sufficiently softened blank to receive an impression is expanded outwards into engagement with the matrix ? 1352

A. The term "generic" to my mind may be very broad in its scope, more than I might wish to convey by answering "yes" or "no."

Re-x-Q. 2. Let us, for the sake of argument, look upon the process of making celluloid records as one specific process, and on the process of making wax records as another specific process. In both of them a matrix is first formed. This is so, is it not ?

A. That is so.



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Re-x-Q. 3. In both of them a blank is introduced in the matrix ; that is so also ?

A. Yes, sir.

Re-x-Q. 4. In both the blank is sufficiently soft to receive an impression ; that is so, is it not ?

A. Yes, sir.

Re-x-Q. 5. And in both the blank is expanded into engagement with the matrix ; that is also true, is it not ?

1354 A. Yes, sir.

Re-x-Q. 6. I understand that in the manufacture of celluloid records it is possible to get good results, not only by softening the celluloid preliminarily by a solvent, but also relying upon heat alone in connection with expansive pressure, but that in the latter case provision must be made for preventing spontaneous combustion or disintegration of the record ?

A. I have always preliminarily softened the blank.

1355 Re-x-Q. 7. So that you are unable to say, even if we took precaution to prevent combustion, that such a process could be carried out in connection with celluloid ?

A. I have often tried this, but have never got anything like as perfect results as I do by preliminarily softening celluloid.

Signature waived.

1356 STATE OF ILLINOIS, COOK COUNTY, SS.

I, ANNIE C. COURTENAY, a notary public within and for the County of Cook and State of Illinois, do hereby certify that the foregoing deposition of Thomas B. Lambert was taken on behalf of Lambert, pursuant to stipulation by counsel, before me, at the offices of Mr. Thomas F. Sheridan, 204 Dearborn street, in the City of Chicago, in said county, on the 28th day of March, 1901 ; that said witness was by me duly sworn before the commencement of his testimony ; that the

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testimony of said witness was written out by me stenographically and afterwards reduced to typewriting; that the opposing party, Thomas A. Edison, was represented by his counsel, Mr. Frank L. Dyer, during the taking of said testimony; that said testimony was taken at the place above named and was commenced at 10 o'clock on the 28th day of March, 1901, and was concluded on the same day; that the signature of the witness was waived by consent of counsel; and that I am not connected by blood or marriage with either of said parties, nor interested directly or indirectly in the matter in controversy.

1358

In testimony whereof I have hereunto set my hand and affixed my seal of office at Chicago, in said county, this 30th day of March, 1901.

ANNIE C. COURTENAY,

Notary Public for Cook County.

[SEAL.]

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**Affidavit of George M. Nesbitt.**

Affidavit for use in a suit about to be brought in the United States Circuit Court for the Northern District of Illinois, Northern Division, by National Phonograph Company against Lambert Company, on patent No. 713,209.

1362 STATE OF ILLINOIS, }  
County of Cook, } ss.:

GEORGE M. NESBITT, being duly sworn, deposes and says as follows :—

1363 I am 30 years of age, and reside in the City of Chicago, Illinois. On December 23d, 1902. I called at the office of the Lambert Company, No. 12 Sherman Street, Chicago, and purchased one of the Lambert indestructible records made and sold by that Company. I have identified this record by writing my name and the date of purchase on the end of the record itself, and also by writing my name and the date on the box or carton in which the record was contained when sold to me. I have attached a tag to the record and box, marked "Exhibit A."

GEORGE M. NESBITT.

Sworn to and subscribed before me, this 23d day of December, 1902.

1364 [SEAL]

SAM'L. POWELL,  
Notary Public.

Answer.

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Nesbitt.

to be brought in  
he Northern Dis-  
National Phono-  
pany, on patent

Answer.

[Filed March 2, 1903.]

CIRCUIT COURT OF THE UNITED STATES,

NORTHERN DISTRICT OF ILLINOIS,

NORTHERN DIVISION.

1366

NATIONAL PHONOGRAPH COMPANY,  
Complainant,

vs.

LAMBERT COMPANY,  
Defendant.

In Equity.  
No. 26,598.  
Patent No. 713,209.

TO THE HONORABLE, THE JUDGES OF THE CIRCUIT COURT  
OF THE UNITED STATES, IN AND FOR THE NORTH- 1367  
ERN DISTRICT OF ILLINOIS, IN CHANCERY SITTING :

The answer of the Lambert Company to the bill of  
complaint of the National Phonograph Company, com-  
plainant.

This respondent, now and at all times hereafter sav-  
ing to itself all and all manner of benefit and advan-  
tage of exception which can or may be had or taken  
to the manifold errors, uncertainties, imperfections and  
insufficiencies in said bill of complaint contained, for  
answer thereto, or unto so much or such parts thereof 1368  
as it is advised it is material or necessary for it to  
make answer unto, answering says :

I. This respondent denies each and every allegation  
in said bill of complaint contained, except as herein-  
after admitted, or specifically answered or avoided.

II. This respondent admits that it is a corporation  
duly organized under the laws of the State of Illinois,  
and a citizen of said State and an inhabitant of the



1369

Northern Division of the Northern District thereof, as alleged in said bill of complaint.

1370 III. This respondent has no knowledge, information or belief as to whether the complainant, National Phonograph Company, is a corporation duly organized and established by law and a citizen of said State of New Jersey, save from the allegation in that regard contained in said bill of complaint, and does not admit that the said complainant is a corporation organized or operating as alleged. And this respondent denies that said complainant is a corporation having any power, organization, or authority to own, hold or operate under any letters patent, or any invention or inventions covered by letters patent, or to bring suit or suits thereunder; and therefore prays that said complainant may be required to make strict proof thereof in this cause.

1371 IV. This respondent admits, upon information and belief alone, that certain Letters Patent of the United States, No. 713,209, were issued to Thomas A. Edison the 11th day of November, 1902, for alleged new and useful Improvements in Processes for Duplicating Phonograms, as alleged in said bill of complaint; but it does not admit that said Letters Patent are good and valid in law, or that the said Thomas A. Edison was the original, first and sole inventor of the pretended inventions or improvements described and claimed therein; or that the said pretended inventions or improvements were the product of the inventive faculty or contained any patentable novelty whatever; or that the said pretended inventions or improvements were not on sale or in public use for more than two years in this country prior to the application for said Letters Patent No. 713,209; or that the said pretended inventions or improvements were not known or used before the alleged invention or discovery thereof by the said Thomas A. Edison; or that the said alleged inventions or improvements were not patented or described in any patent or printed publication in the United States before the invention

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respondent denies that  
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or discovery thereof by the said Thomas A. Edison, or  
more than two years prior to his application for said  
Letters Patent ; or that the said Thomas A. Edison or  
his legal representatives or assigns had not made any  
application for foreign patent or patents more than  
seven months prior to the application for said Letters  
Patent No. 713,209 in the United States of America ;  
or that the said complainant has invested and ex-  
pended large sums of money and has been to great  
trouble in and about the said invention for the purpose  
of introducing the same and making it profitable to the  
public ; or that the validity of said Letters Patent has  
ever been affirmed by any court having jurisdiction in  
patent matters, as alleged in said bill of complaint ;  
and this respondent calls upon the complainant for  
strict proof as to such matters and each and every of  
them.

V. This respondent admits that prior to the  
granting of said Letters Patent No. 713,209 to the  
said Thomas A. Edison, to-wit, on the 16th day  
of May, 1900, interference proceedings were in-  
stituted by the Commissioner of Patents be-  
tween the application for said patent and  
Letters Patent of Thomas B. Lambert No. 645,920,  
dated March 20, 1900, for the purpose of determining  
the question of priority of invention of the subject  
matter covered by claim 17 of the said Edison patent  
No. 713,209 and claim 1 of the said Lambert patent  
No. 645,920 ; and that, after various interlocutory  
questions and hearings on the matter before the Board  
of Examiners-in-Chief and Commissioner of Patents,  
decisions were rendered granting priority of invention  
to the said Thomas A. Edison ; but this respondent  
denies that there was any interference in fact between  
said Edison application and the Lambert patent, and  
averts that if there was any interference in fact between  
said application and patent, the said Edison was guilty  
of wilful negligence in postponing his disclosure of the  
said invention to the public until after others had ac-



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quired rights which it is now unjust and inequitable to destroy—as by reference to the files of said interference or duly authenticated copies thereof here in Court to be produced, if required, will more fully appear.

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VI. This respondent avers that it has no knowledge, save from said bill of complaint, that before the signing of this bill, or at any time, the said Thomas A. Edison, by an instrument in writing signed by him and duly executed and delivered, sold, assigned, transferred and set over unto the said complainant, the National Phonograph Company, the full and exclusive right, title and interest in and to said Letters Patent No. 713,209, and in and to the invention described and claimed therein, together with any and all rights of action, claims and demands whatsoever of the said Edison, either at law or in equity, for damages or profits, or both, arising from past infringement of said Letters Patent, with the full right to the said complainant

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in his own name to sue upon and collect the same for its own use and behoof; and that the said complainant has ever since been and is now possessed of the same; and this respondent calls upon the complainant for strict proof as to such matters and each and every of them.

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VII. This respondent denies that it has ever in any way made, used, or caused to be made phonograms by the employment of the said improved process of duplicating phonograms containing and embodying the invention set forth in Letters Patent No. 713,209; or that it used or caused to be used the said invention in the manufacture of its phonograms, or still continues so to do; or that it has threatened or is threatening to continue the alleged unlawful acts set forth in said bill of complaint in defiance of the rights secured to the said complainant; but, on the contrary, this respondent avers and insists that all of its operations with regard to the manufacture of its phonograms have been conducted in good faith and as a matter of right, and

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not in violation or infringement of any right of the  
said complainant, or otherwise, and calls upon the  
said complainant for strict proof as to these matters  
and each and every of them.

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VIII. This respondent admits that it is engaged in  
a corporate capacity only in the manufacture, sale and  
use of celluloid phonograms; that it has in good faith  
manufactured such phonograms and placed them upon  
the market and that such articles have met with great  
favor at the hands of the public and have proved very  
successful; and it charges that it is by reason of this  
fact and in pursuance of a scheme on the part of the  
complainant to appropriate the business and good-will  
of this respondent that the said bill of complaint has  
been brought.

1382

IX. This respondent denies that the said Thomas  
A. Edison made application in accordance with the  
then existing laws of Congress to the proper depart-  
ment of the United States for Letters Patent; or whether  
the said patentee complied with the conditions and  
requirements of said law; or whether the said Letters  
Patent were signed, sealed, executed and issued in due  
form of law; and it therefore leaves the complainant  
to make such proof thereof as it may deem advisable.

1383

X. This respondent avers that the subject matter  
contained in the claims of said Letters Patent No.  
713,209, issued to said Thomas A. Edison November  
11, 1902, is different from and is not for the same in-  
vention originally filed in the application for said Let-  
ters Patent, and alleges that no supplemental oath, as  
required by law, was filed in support of the amend-  
ments by which such claims were introduced; where-  
fore this respondent submits that said claims as issued  
are void and of no effect, inasmuch as the claims as is-  
sued were drawn to cover and include devices which  
had come into existence between the date of the filing

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of such application and the date of said Letters Patent.

XI. This respondent further answering, on information and belief, says :

1. That the alleged invention or discovery described and claimed in said Letters No. 713,209 was and is not an invention or discovery, or the proper subject matter of letters patent of the United States, and that the same was and is the result of mere mechanical skill.

1386

2. This respondent avers, on information and belief, that the alleged invention described and claimed in said Letters Patent No. 713,209 is not and never has been of any practical utility or value whatever ; and it also further denies that the process described in said Letters Patent will produce the effect or accomplish the result described in said Letters Patent, or is or would be a practical process for the uses and purposes indicated.

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3. That the said patentee, Thomas A. Edison, constructively abandoned the invention described and claimed in said Letters Patent No. 713,209, by not applying for a patent thereon for more than two years after it was in public use in this country.

1388

4. That for the purpose of deceiving the public the description and specification filed by the patentee in the Patent Office contained less than the whole truth relative to his invention or discovery, or more than is necessary to produce the desired effect ; and that the description of the invention in the specification is not in such full, clear, concise and exact terms as to enable any persons skilled in the art to which it appertains to make, construct, compound and use the same.

5. This respondent further avers and states that the claims as issued in said Letters Patent No. 713,209 are not distinct, in that they do not particularly point out and distinctly claim the part, improvement, or combination which the said alleged inventor claims as his invention or discovery.

6. This respondent further avers and states that said Letters Patent No. 713,209 were surreptitiously

1389

obtained for the alleged invention described and claimed, which invention or inventions was or were in fact invented by others, who were using reasonable diligence in adopting and perfecting the same, because of which said Letters Patent are therefore void and of no effect.

XII. This respondent denies, on information and belief, that the said Thomas A. Edison was the original and first inventor or discoverer of the alleged inventions or improvements described and claimed in said Letters Patent No. 713,209; but, on the contrary, it avers and insists that the said alleged invention and improvements were in public use long prior to the pretended invention or discovery thereof by the said Thomas A. Edison, and particularly that the same were known and used at the following named places and by the following named persons, to-wit:

George H. Herrington, at Wichita, Kansas, and elsewhere,—present residence Wichita, Kans. 1391

Edward H. Johnson, at New York, N. Y., and elsewhere,—present residence New York, N. Y.

William B. Carpenter, at Newark, N. J., and elsewhere,—present residence Newark, N. J.

Celluloid Novelty Company, at New York, N. Y., and elsewhere,—present residence New York, N. Y.

Celluloid Manufacturing Company, at New York, N. Y., and elsewhere,—present residence New York, N. Y. 1392

Horace K. Petit, at Fishkill-on-the-Hudson, N. Y., and elsewhere,—present residence Fishkill-on-the-Hudson.

Thomas A. Edison, at Llewellyn Park, N. J., and elsewhere,—present residence Llewellyn Park, N. J.

Emil Berliner, at Washington, D. C., and elsewhere,—present residence Washington, D. C.

Eldridge R. Johnson, at Philadelphia, Pa., and elsewhere,—present residence Philadelphia, Pa.



1393

Thomas B. Lambert, at Chicago, Illinois, and elsewhere,—present residence Chicago, Illinois.

H. G. Wolcott, at Fishkill-on-the-Hudson, N. Y., and elsewhere,—present residence Fishkill-on-the-Hudson, N. Y.

1394

XIII. This respondent denies, on information and belief, that the said Thomas A. Edison was the original, first and sole inventor or discoverer of the alleged inventions and improvements described and claimed in said Letters Patent No. 713,209; but, on the contrary, avers and insists that the said alleged invention and improvements are described and claimed in various patents and publications long prior to the pretended invention thereof by the said Thomas A. Edison, and particularly in the following named patents and publications, to-wit:

1395

N. A. Douner, No. 91,100, June 8, 1869.

C. S. Brooks, No. 187,095, February 6, 1877.

W. B. Carpenter, No. 237,168, February 1, 1881.

J. W. Hyatt, No. 239,791, April 5, 1881.

M. C. Lefferts, No. 281,529, July 7, 1883.

T. A. Edison, No. 382,419, May 8, 1888.

G. H. Herrington, No. 397,856, February 12, 1889.

T. A. Edison, No. 406,571, July 9, 1889.

W. W. Jacques, No. 413,382, October 22, 1889.

G. H. Stevens, No. 650,431, May 29, 1900.

H. G. Wolcott, No. 650,739, May 29, 1900.

A. N. Petit, No. 657,956, September 18, 1900.

1396

I. W. Heysinger, No. 460,338, September 29, 1901.

T. A. Edison, No. 526,147, September 18, 1894.

H. J. Lioret, No. 528,273, October 30, 1894.

F. T. Burgis, No. 537,003, April 9, 1895.

E. Berliner, No. 548,623, October 29, 1895.

#### BRITISH LETTERS PATENT.

Jonathan Lewis Young, No. 1478 of January 23, 1894; and German Patent, No. 108,308.

XIV. This respondent, further answering upon information and belief, avers that the alleged invention

1397

described and claimed in said Letters Patent No. 713,209 was in public use and on sale by others, and at places other than those before cited, prior to the alleged invention or discovery of the same by the said Thomas A. Edison and prior to the filing of the original application for said letters patent; that it has been diligent in its efforts to ascertain their names and residences, and where used when patented, and it therefore prays leave of this Honorable Court on obtaining such information to file its amended answer herein setting forth the same. 1398

XV. This respondent, further answering, on information and belief, denies that the complainant herein would have been in undisputed possession or enjoyment of any valuable or exclusive privilege secured by said Letters Patent and in the receipt of profits therefrom, except for the acts of these defendants; but, on the contrary, avers that others have manufactured phonograph records in a similar manner openly and without any restriction being placed thereon in any way whatever; and it therefore leaves the said complainant to make such proof thereof as it may deem necessary. 1399

XVI. This respondent, further answering, denies that the complainant has sustained any loss, injury or damage by reason of any wrongful or unlawful acts or doings of this respondent; or that the said complainant is entitled to any damages, profits or gains as in said bill alleged, or to an accounting for profits against this respondent; and it also denies that the said complainant will be subjected to great and irreparable damage or injury unless this Court shall grant the relief herein prayed for, or that the said complainant will suffer any damage by reason of the acts of this respondent; as well as further denying that this complainant has any right to an injunction, provisional or perpetual, against this respondent, or to any other right or relief whatever, as prayed for in said bill of complaint. 1400



1401

Without this, that any other matter, cause or thing in said bill of complaint contained, material or necessary for this respondent to make answer unto, and not herein and hereby well and sufficiently answered unto, confessed and avoided, traversed or denied, is true; all of which matters and things this respondent is ready and willing to aver, maintain and prove, as this Honorable Court shall direct, and prays to be hence dismissed with its reasonable costs and charges in this behalf most wrongfully sustained.

And this respondent will ever pray, etc.

LAMBERT COMPANY,

By ALBERT D. PHILPOT,  
Secretary.

[CORPORATE SEAL.]

THOMAS F. SHERIDAN,  
Of Counsel.

1403

STATE OF ILLINOIS, }  
County of Cook. } ss.

On this 28th day of February A. D. 1903, before me a Notary Public within and for the County and State aforesaid, personally appeared Albert D. Philpot, personally known to me, and made oath that he is the President of the above named defendant; that he has read the foregoing answer and knows the contents thereof; and that the same is true of his own knowledge, except as to those matters therein stated on information and belief, and as to these he believes it to be true.

1404

[SEAL.]

ANNIE C. COURTENAY,  
Notary Public for Cook County.

**Memorandum of Judge Kohlsaas.**

[June 17, 1903]

IN THE CIRCUIT COURT OF THE UNITED  
STATES,

NORTHERN DISTRICT OF ILLINOIS,

1406

NORTHERN DIVISION.

NATIONAL PHONOGRAPH CO.

v.

LAMBERT CO.

No. 26,598.

1407

**KOHLASAAT, J.**

Complainant files this bill to enjoin infringement of claim 17 of patent No. 713,209 covering a method for producing records for phonographs which may be briefly described as a means for producing records by pressing some plastic material suitable for records upon a matrix formed upon the inner surface of a metallic cylinder.

The cause comes now on to be heard upon a motion for a preliminary injunction. The process covers the preparation of the matrix and the application and removal of the record material therefrom. On Aug. 14, 1899, defendant's assignor, Thomas B. Lambert, filed an application for a process of making celluloid record, and was granted a patent thereon March 20, 1900, numbered 645,920. On October 29, 1888, complainant's assignor, Thomas A. Edison, filed his caveat for improvements in phonographs. March 5, 1898, Edison filed his application for a process of duplicating phonograms. Afterwards and subsequent to the

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granting of the Lambert patent, Edison amended his application by adding claim 17, which is identical with claim 1 of the Lambert patent. This apparently tardy action was brought about by miscarriage of the mails. An interference was disclosed and the patent office awarded the priority and patent No. 713,209 to Edison. From the award Lambert appealed to the Examiner in Chief and then to the Commissioner of Patents, but was unsuccessful.

1410

No appeal was taken to the Court of Appeals for the District of Columbia. The defendant is therefore concluded by the award from further contesting the question of priority with complainant:

Morgan v. Daniels, 153 U. S., 120 ;  
Ecaubert v. Appleton, 67 Fed. Rep., 916 ;  
Farrett v. Ewart Co., 58 Fed. Rep., 360.

1411

Objection is made that the complainant's title is not properly established. By documentary evidence since supplied. I deem the point not well taken. The evidence of infringement is very unsatisfactory, consisting:

1st. Of the affidavit of George N. Nesbitt in which he states that on December 23, 1902, he purchased one of the Lambert indestructible records made and sold by defendant at defendant's office.

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2nd. The failure of defendant to deny in its answer complainant's allegation in clause 8 of its bill to the effect that defendant is manufacturing phonograms under and in accordance with letters patent No. 645,920.

As to the affidavit of Nesbitt it does not appear that the record purchased was made by the process of claim 17 of complainant's patent, nor that it was made since the granting of said patent No. 713,209 to complainant's assignor. The court is not at liberty to assume essential facts on such a motion.

If the defendant is manufacturing records in accordance with patent No. 645,920, it is infringing complainant's patent. The allegations of Sections 7

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and 8 are in effect that defendant did, after the granting of the complainant's patent and before the commencement of this suit, wrongfully make or cause to be made and is now making or causing to be made records by the employment of the process covered by claim 1 of patent No. 645,920. This defendant does not deny. It simply denies that it did make or is making records by means of complainant's method. This is evasive and cannot avail as a denial of the charge of the bill in that behalf.

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In the absence of proof, the court cannot assume that the patents set out in the answer, in any manner, effect the validity of complainant's patent, nor is there merit in defendant's claim of undue negligence on the part of complainant, under all the circumstances of the case. That the process of the patent in suit is a new and useful one, the court, in the absence of evidence to the contrary, finds substantially sustained by the evidence, including the exhibit. Defendant suggests that, in view of additional proof presented by complainant, it should not have been forced to a hearing at this time. The court is and has been open to any application by defendant for reasonable time to prepare its case. None has been made and the suggestion at this time and on this hearing ought not to be considered.

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The complainant is entitled to the relief sought and the preliminary injunction may issue.

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**Motion for Rehearing.**

[Filed June 19 1903]

CIRCUIT COURT OF THE UNITED STATES,

NORTHERN DISTRICT OF ILLINOIS,

NORTHERN DIVISION.

1418

NATIONAL PHONOGRAPH COMPANY,  
Complainant,

vs.

LAMBERT COMPANY,  
Defendant.In Equity.  
No. 26,598.To MESSRS. ISHAM, LINCOLN & BEALE,  
Solicitors for Complainant.

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Please take notice that on Monday, the 22nd day of June, at 10 A. M. or as soon thereafter as counsel can be heard, I shall appear before His Honor Judge KOHLSAAT, United States District Judge, in the Court Room usually occupied by him in the Marquette Building, and move (1) for leave to amend the answer of defendant and for the entry of an order relating thereto; (2) for leave to file an affidavit on behalf of defendant in support thereof; and (3) and for such other and further relief in the premises as may seem just and equitable. Copies of all papers are attached hereto.

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THOMAS F. SHERIDAN,  
Solicitor for Defendant.

Chicago, June 18th, 1903.

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Service of the above accepted this 18th day of June,  
A. D. 1903.

ISHAM, LINCOLN & BEALE,  
Solicitors for Complainant.

CIRCUIT COURT OF THE UNITED STATES,

NORTHERN DISTRICT OF ILLINOIS,

NORTHERN DIVISION.

NATIONAL PHONOGRAPH COMPANY,  
Complainant,

vs.

LAMBERT COMPANY,  
Defendant.

1422

In Equity.  
No. 26,598.

**Petition of Defendant for Re-Hearing.**

TO THE HONORABLE, THE JUDGES OF THE CIRCUIT COURT  
OF THE UNITED STATES, FOR THE NORTHERN DIS-  
TRICT OF ILLINOIS: 1423

Your petitioner, the Lambert Company, respectfully  
asks a re-hearing in this case in view of the amended  
record, and as ground for such re-hearing avers:

1. That it has amended its bill of complaint, spe-  
cifically denying that it has, since the grant of the  
Letters Patent upon which this suit is brought and  
before or since the beginning of this suit, it has made  
or caused to be made phonograms or records in or 1424  
under the process described and claimed in claim 1 of  
its Letters Patent No. 645,920, dated March 20, 1900.

2. That such denial was overlooked in its Answer, in  
view of the fact that it had already denied—in Para-  
graph VII—that it had ever made, used, or caused to  
be made phonograms containing and embodying the  
invention set forth in the Letters Patent No. 713,209,  
or that it had used or caused to be used the said inven-  
tion in the manufacture of its phonograms, or still con-



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tinued so to do ; or that it has threatened or is threatening to continue the alleged unlawful acts set forth in the bill of complaint in defiance of the rights of said complainant ; but, on the contrary, this respondent avers and insists that all of its operations with regard to the manufacture of its phonograms have been conducted in good faith and as a matter of right, and not in violation or infringement of any right of the said complainant, or otherwise, and calls upon the said complainant for strict proof as to these matters and each and every of them ; and that it thought that the foregoing denial was sufficient, as claim 17 of said Letters Patent No. 713,209 is asserted by complainant to be exactly the same in language and legal effect as claim 1 of your petitioner's Letters Patent No. 645,920 on account of the Patent Office having already held both of such claims to be the same and said claim 17 being in fact a literal quotation of claim 1 of petitioner's patent No. 645,920.

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3. That your petitioner has filed an affidavit in support of the amendment, specifically denying that it is manufacturing or causing to be manufactured, or has manufactured any phonograms under said Letters Patent No. 645,920 since the granting of said Letters Patent No. 713,209 to complainant and before or since the beginning of this suit, but, on the contrary, is operating under other Letters Patent, and applications which are pending before the United States Patent Office and on which the claims stand allowed and which Letters Patent were pending simultaneously with Letters Patent No. 713,209 and No. 645,920, and yet the Commissioner has not rejected any claim of said application on either of said Letters Patent, or referred to them in any way,—all of which goes to show that your petitioner has been operating, as alleged in its answer, in good faith, and not in violation or infringement of any rights of the said complainant, or otherwise.

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4. That in view of the opinion of this Honorable Court being to the effect that it does not appear that your petitioner has infringed or is infringing claim 17 of complainant's patent, no injunction would have been ordered had defendant denied the allegations contained in Paragraph VIII of the Bill of Complaint.

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5. That the Bill of Complaint was filed early in January of the present year, the Answer early in March, and the Replication early in April, the hearing having been had on the 29th day of April, and that up to within a few days of the hearing and after petitioner's brief had been prepared no title having been shown in this case which would enable complainant to recover for any alleged infringement or obtain an injunction, and further in view of the fact that in the closing clause of its opinion the Court states that "it is open and has been open to any application by defendant for reasonable time to prepare its case", it is now respectfully asked that the case be re-opened for the introduction of the amendment to its answer and of the affidavits of the defendant company in support thereof, and that a re-hearing be granted your petitioner upon the amended answer and affidavits in support thereof attached hereto.

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Wherefore, your petitioner prays that his Honorable Court will be pleased to grant the petition prayed for in this case and appoint a day definite for such proceedings therein, as to this Honorable Court may seem just.

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LAMBERT COMPANY,

By ALBERT D. PHILPOT,

Sec'y.

THOMAS FRANCIS SHERIDAN,

Solicitor and of Counsel for Petitioner.



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State of Illinois, }  
County of Cook. } ss.

Albert D. Philpot, being duly sworn, says that he has read the foregoing petition, and that the same is true of his own knowledge, information and belief, said knowledge being derived from the record in this case and from the opinion delivered by this Honorable Court.

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ALBERT D. PHILPOT.

Subscribed and sworn to before me this 18th day of June A. D. 1903.

[NOTARIAL SEAL.]

HENRY I. CROMER,  
Notary Public.

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I hereby certify that I have examined the foregoing petition, and in my opinion it is well founded and the case one in which the petition should be granted by this Court, and I further certify that the petition is not interposed for purposes of delay.

THOMAS F. SHERIDAN,  
Solicitor and of Counsel for Petitioner.

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A.  
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**Affidavit of Albert D. Philpot.**

CIRCUIT COURT OF THE UNITED STATES,

NORTHERN DISTRICT OF ILLINOIS,

NORTHERN DIVISION.

NATIONAL PHONOGRAPH COMPANY,  
Complainant,

vs.

LAMBERT COMPANY,  
Defendant.

1438

In Equity.  
No. 26,598.

STATE OF ILLINOIS, }  
County of Cook. } ss.

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ALBERT D. PHILPOT, of Chicago, Illinois, being first  
duly sworn, deposes and testifies as follows :

That he is secretary of the above named Company  
and has been connected with the same ever since its  
inception ; that he is and has been acquainted with all  
its operations in the manufacture of phonograph records  
ever since its inception ; that he is acquainted with Let-  
ters Patent No. 645,920, granted to Thomas B. Lambert  
March 20, 1900, and assigned to the defendant Com-  
pany and with the subject matter contained therein ; 1440  
that he is also acquainted with the record in this cause  
and has carefully read the bill of complaint, the  
answer of defendant, the affidavits of complainant and  
the opinion of this Honorable Court ; that he has read  
the proposed amendment to Paragraph VIII of the  
answer, in which respondent denies that it has since  
the grant of Letters Patent No. 713,209 to  
complainant and before the commencement of  
this suit, within and for the Northern District of  
Illinois or elsewhere, made or caused to be made



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phonograms in accordance with claim 1, or any other claim of said Letter Patent No. 645,920; that it is true to his own knowledge—in view of the fact that he has had charge of the works of the defendant company—that said company abandoned the use of the process described and claimed in said Letters Patent No. 645,920 long prior to the issuance of Letters Patent No. 713,209 to complainant, and has not manufactured or caused to be manufactured phonograms since said

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abandonment, but, on the contrary, that it had begun operations under another and substantially different process as described and claimed in an application filed in the Patent Office in June, 1900, and in which eight claims stand allowed; that said application was pending for nearly two years in the Patent Office before Mr. Edison's application was issued, and yet it was not placed in interference with such application or patent, nor has the Edison patent since been referred to.

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Affiant further states that it is his opinion that the process is substantially different, and for such reason was not thrown into interference with Mr. Edison's patented application, or his patent referred to as a cause for rejecting any of the claims therein; that such application has not as yet resulted in a patent, owing to the fact that applicant has been in interference with other parties, which has heretofore interfered with the issuance of its patent; that the Lambert Company has completed the taking of its proofs in this interference; that the other parties thereto having failed to do so, a

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hearing is to be had at an early day, which will undoubtedly result in the award of the interference to the Lambert Company, and that such patent will therefore issue some time in July or August; that said defendant does not desire at the present time to disclose the subject matter of said application to complainant, in view of its patentable nature, but that it is perfectly willing so to do at the time of the taking of its evidence in this cause, which will amply justify its withholding such information until

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such time and its operations in the manufacture of phonograms and phonographic records.

ALBERT D. PHILPOT

Subscribed and sworn to before me this 18th day of June A. D. 1903.

HENRY I. CROMER,  
Notary Public for Cook County.

**Motion to Amend Answer.**

CIRCUIT COURT OF THE UNITED STATES,

NORTHERN DISTRICT OF ILLINOIS,

NORTHERN DIVISION.

NATIONAL PHONOGRAPH COMPANY,  
Complainant,

vs.

LAMBERT COMPANY,  
Defendant.

In Equity.  
No. 26,598.

And now comes the defendant, Lambert Company, by its counsel appearing in its behalf, and moves the Court (1) for leave to amend the answer in this cause, as per amendment attached hereto and forming a part of this motion; (2) for permission to file an affidavit of Albert D. Philpot, Secretary of said Company, in support of said amendment—making certain denials—and to have such affidavit made a part of the record in this cause; and (3) for such other and further relief in the premises as to your Honor shall seem meet.

THOMAS F. SHERIDAN

Solicitor and of Counsel for Defendant.

Chicago, June 19, 1903.



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CIRCUIT COURT OF THE UNITED STATES,  
NORTHERN DISTRICT OF ILLINOIS,  
NORTHERN DIVISION.

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NATIONAL PHONOGRAPH COMPANY  
Complainant,

vs.

LAMBERT COMPANY,  
Defendant.

In Equity.  
No. 26,593.

**Amendment to Answer.**

And now comes the above named defendant, by  
1451 Thomas F. Sheridan, its solicitor, and amends its  
answer in the following particulars :

By inserting at the end of Paragraph VIII the fol-  
lowing :

but this respondent denies that it has since the  
grant of said Letters Patent No. 713,209 and before  
the commencement of this suit, within the Northern  
District of Illinois or elsewhere, made or caused to be  
made phonograms in accordance with claim 1, or any  
other claim, of its Letters Patent No. 645,920, issued  
1452 to Thomas B. Lambert.

so that as amended said Paragraph VIII will read as  
follows :

VIII. This respondent admits that it is engaged in  
a corporate capacity only in the manufacture, sale and  
use of celluloid phonograms ; that it has in good faith  
manufactured such phonograms and placed them  
upon the market and that such articles have  
met with great favor at the hands of the  
public and have proved very successful, and it charges  
that it is by reason of this fact and in pursuance

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of a scheme on the part of the complainant to appropriate the business and good-will of this respondent that the said bill of complaint has been brought; but this respondent denies that it has since the grant of said Letters Patent No. 713,209 and before the commencement of this suit, within the Northern District of Illinois or elsewhere, made or caused to be made phonograms in accordance with claim 1, or any other claim, of its Letters Patent No. 645,920, issued to Thomas B. Lambert.

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Dated at Chicago, Illinois, this 18th day of June, 1903.

THOMAS F. SHERIDAN  
Solicitor for Defendant.

**Memorandum of Judge Kohlsaas.**

[July 29, 1903]

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IN THE UNITED STATES CIRCUIT COURT,

NORTHERN DISTRICT OF ILLINOIS,

NORTHERN DIVISION.

NATIONAL PHONOGRAPH CO.

VS.

LAMBERT CO.

KOHLASAAT,  
District Judge.  
No. 26,598.

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This cause comes up on defendant's motion for a rehearing, and upon complainant's motion for a preliminary injunction. Heretofore on the like motion of complainant the Court rendered its opinion sustaining the validity of the patent and the title



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thereof in complainant, granting the motion on the ground mainly that defendant failed in its answer to sufficiently and specifically negative the allegation of infringement. The answer contained a general allegation traversing the charge, but seemed to me to equivocate somewhat in denying the clause thereof, making specific allegations of infringement.

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Leave was given defendant to amend its answer in this respect, which was done. The proof therefore of infringement rests entirely upon the affidavits of Taylor and Nesbitt and the record filed as an exhibit in the case.

From these it appears that Nesbitt purchased from defendant about six weeks after the patent in suit was granted, a record marked "Pat'd Mch. 20, 1900".

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From Taylor's affidavit it appears that patent No. 645,920 was granted on that date. Complainant insists that this evidence is sufficient to establish the fact, for the purposes of this motion, that defendant was on December 23, 1902 manufacturing and selling records made under the process of the patent in suit. The Court cannot proceed upon the presumption on this hearing that this record was made since the granting of the patent in suit. From all that appears in the record it may have been made prior to that date. There remains to be considered therefore only the question as to whether defendant had the right to sell the record even though it were made prior to the grant to complainant. The patent in suit is for a process, not for the article produced. A patent for a process is not infringed by selling the product:

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Welsbach Light Co. vs. Union I. Light Co.,  
101 Fed., 131.

This being so, I am of the opinion that the proof fails to make such a case of infringement as would justify the granting of a preliminary injunction herein. The motion for a preliminary injunction is denied.

**First Affidavit of Frank L. Dyer.**

UNITED STATES CIRCUIT COURT,

NORTHERN DISTRICT OF ILLINOIS,

NORTHERN DIVISION.

NATIONAL PHONOGRAPH COMPANY

VS.

LAMBERT COMPANY.

In Equity, No.  
26598.  
On Edison Patent  
No. 713209.

1462

**Affidavit of Frank L. Dyer.**

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STATE OF NEW YORK, }  
County of New York, } ss

FRANK L. DYER, having been first duly sworn, on oath doth depose and say as follows :

I am by profession a patent lawyer and solicitor and mechanical expert, and since the year 1886 have been continuously employed in connection with patents and inventions. Since 1897 I have had entire charge of all of Mr. Edison's applications for patents, including many cases relating to phonographs. Since April 1903 I have been located at the Edison Laboratory, and have been in very close touch with Mr. Edison and his work. I have been familiar with the talking machine art since its commercial inception, and am acquainted also with the development of the art of duplicating phonograph records, to which the patent in suit relates. I have frequently been called upon as mechanical expert in suits based on patents, and have testified in a number of cases relating to the phono-

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graphic art, including suits in this Circuit against the present defendant. I prepared the application for the patent in suit and had entire charge of the prosecution of that application in the Patent Office, including the handling of the interference with the Lambert patent referred to in the moving papers.

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The patent in suit relates to a process for producing duplicate copies of phonograph records. In order that these duplicate copies may be obtained, it is first necessary to construct an accurate mold whose bore shall carry a representation of the record in negative.

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The preferred process which the patent in suit describes for making such a mold consists of first securing an original or master record made in a phonograph on the usual waxlike recording material, then in applying a conducting coating to said master record by a process of so-called vacuous deposit, then in electroplating a copper shell on the coated master record, then in applying a jacket to said shell, and finally in removing the original master from the mold so obtained. While the patent in suit describes the application of the conducting coating by a process of vacuous deposit and gives the reasons for the preference for such a step, it states that the conducting coating may be applied in other ways, as for instance by the use of "a very thin layer of specially prepared plumbago of exceedingly great fineness." Having obtained a suitable mold, the special process described

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in the patent in suit for securing duplicates therefrom consists in introducing a blank cylinder within said mold, in then subjecting said blank to heat so as to cause it to expand into engagement with the record surface of the mold, and in finally introducing a tapered mandrel within the blank so as to further expand it into absolute intimate engagement with said record surface to thereby take an impression therefrom. After the impression has been thus received, the resulting duplicate is removed by permitting it to cool to a sufficient extent as to result in a radial con-



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traction to clear the engaging surfaces, whereupon the duplicate may be directly removed from the mold.

Although the Edison patent in suit contains a number of very broad claims, all of which cover the process used by defendant, yet I shall limit my consideration only to the 17th claim, since that claim was made the issue of the interference with the Lambert patent No. 645920 and in fact is identical with the first claim of that patent. The claim is as follows :

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"17. The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement."

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The meaning of this claim is perfectly clear. It covers any method or process of producing duplicate phonograph records or record cylinders wherein a mold is first obtained by rendering the surface of an original master record formed in wax or other relatively soft material electrically conductive and then in electrolytically depositing a metal on the coated master so as to form a matrix, and wherein duplicates are obtained from said matrix by outwardly expanding under pressure within the matrix a tubular blank of material sufficiently soft to receive an impression and sufficiently thick to maintain its shape throughout the process, and in finally removing the duplicate so obtained by a direct longitudinal movement. The limitation in the claim to the employment of "a cylinder or tube of softened material suffi-

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ciently thick to maintain its shape during and after the act of disengagement from the matrix" was introduced therein originally by Lambert in his patent, and then by Edison when the same claim was suggested to Edison by the Patent Office, for the purpose of distinguishing the invention from a prior British patent No. 1478 of 1894 granted to J. L. Young, which described a process for making duplicate records on blanks which were so thin that

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they could be removed after an impression had been secured by collapsing the same inwardly away from the matrix. The limitation in the claim to the step of "finally removing the cylinder or tube by direct longitudinal movement" was introduced therein for the purpose of distinguishing from a prior U. S. patent to one Lioret, in which the duplicates had to be necessarily removed by unscrewing them from the mold. Such an expedient in the duplication of modern phonograph records would necessitate giving the duplicate

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more than 400 complete rotations, since the pitch of the record groove is 100 threads per inch, while the length of the record is more than 4 inches.

The process described in Lambert patent No. 645920 of March 20, 1900, consists in making a mold exactly as described by Edison, namely, by first securing an original or master record, applying a conducting coating thereto, electroplating a deposited shell on said coating, backing up said shell by a jacket, and finally removing the original master. The preferred step of

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applying a conducting coating to the original master record described in the Lambert patent is by a layer of graphite or plumbago, as specifically described by Edison. In making duplicate records from such a mold according to the Lambert patent in question, a cylinder or tube of cellulose or vulcanized rubber "either in a raw or partially cured state or previously softened in some solution" was introduced within the mold "and by means of an expansive pressure with heat forced outwardly, completely filling the matrix, and against the inner surface there-

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of, thus making a counterpart of the same and a record similar to that on the original wax cylinder." For the removal of the finished duplicate record the patent states:

"The ring thus formed, having on its outer face a faithful imprint of the matrix, is then allowed to harden, either naturally or by artificially curing the substance thereof, through which hardening it shrinks sufficiently to enable its subsequent removal to be made from the matrix without injury to either. As a shrinking or reducing medium I have used a solution of hydrochlorous acid and water in which the tube and matrix are placed, as above, so that the tube can be removed from its engagement with the matrix" (p. 2, lines 7 to 19). 1478

In a specific sense the process thus described in the Lambert patent in question differed from the special embodiment of Mr. Edison's invention outlined by him in the patent in suit. So far as the making of the matrices or molds is concerned, the two processes are substantially identical, Edison preferring to apply the conducting coating by a process of vacuous deposit, and Lambert describing only the use of graphite or plumbago, which, although referred to by Edison, was evidently regarded as less desirable than a coating applied by a vacuous deposit. The materials referred to in the two patents from which the duplicates were to be made also were different, since Lambert referred only to cellulose and vulcanized rubber, whereas Edison referred not only to the usual waxlike material as well as celluloid and vulcanized rubber, but also many other materials including chalk slaked lime, lamp-black, sealing-wax, shellac, polished ebonite and glue. The specific steps for taking the impression from the mold also differed in the two patents, since Lambert suggested the possibility of previously softening the material before its 1479 1480



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introduction into the matrix. The final step of removing the finished duplicate from the mold was also different in the two patents, since with the Edison process the duplicate was allowed to cool so as to shrink radially, whereas with the process of the Lambert patent the duplicate was shrunk by the use of a solution of hydrochlorous acid and water. Notwithstanding these specific differences between the two processes, the Patent Office declared an interference between Edison and

1482

Lambert, and although strenuous efforts were made by Lambert to have that interference dissolved, both the Examiner and the Commissioner in person decided, after a very careful review of the entire situation, that from a patentable standpoint the two processes were identical, and that the 17th claim as made by Edison applied just as effectively to the Lambert process as did the first claim of the Lambert patent apply to the Edison process.

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On Thursday morning, July 23, 1903, at the invitation of Mr. Albert D. Philpot, the secretary of the defendant Company, I visited the factory of that Company at the corner of Jefferson and Monroe Streets, Chicago, Illinois, for the purpose of witnessing the manufacture of duplicate phonograph records as carried out at the present time by the Lambert Company. I was accompanied also by Mr. Henry Hecht, Jr., a mechanic employed by the National Phonograph Company. I have read the affidavit of Mr. Hecht, verified on the 24th day of July 1903, and agree with him in

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his statement of the operations carried out by the Lambert Company in its factory. I witnessed all the operations described by Mr. Hecht, including the manufacture of matrices or molds and the production of duplicate records therefrom. Mr. Philpot informed me that the process and apparatus employed by the Lambert Company were those described in the Messer patent No. 705772 dated July 29, 1902, a copy of which I attach hereto. Mr. Philpot was quite right in identifying the apparatus now used by the Lambert Company with that of this

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Messer patent, but he was mistaken in stating that the process now used by his concern is that of the Messer patent, since the two are not exactly the same, although to a layman they no doubt might appear substantially identical. With the Messer apparatus as described in the patent in question and actually used by the Lambert Company, a suitable base (*m*) was provided for receiving the mold or matrix (*o 8 c*) which the Messer patent states "is preferably formed in the manner shown and described in patent No. 645920 issued to Thomas B. Lambert March 20, 1900". Leading up through the base (*m*) is a pipe (*q*) to which steam may be admitted through a pipe (*r*) having a valve (*n*) and to which compressed air may be admitted through a pipe (*w*) having a valve (*v*). Surrounding the pipe (*q*) is an exhaust pipe (*s*) leading to a pipe (*t*) having a valve (*y*). The base plate (*m*) is provided with a series of vents (*6*) arranged concentrically of the inlet and exhaust pipes. Extending up from the base (*m*) is a standard (*I*) in which works a plunger (*f*) carrying a disk (*d*) at its lower end adapted to seal the mold at its top and provided with a row of perforations (*4*) extending around near its periphery. A wedge (*k*) locks this disk in its position with respect to the mold. In carrying out the process as actually employed by the Lambert Company, celluloid blanks are first secured, as described by Mr. Hecht, of the right length, with intumed end flanges and whose outer surfaces have been treated with a preparation to make them as uniform as possible, and one of these blanks is then inserted in the mold and the top disk brought down so as to close the upper end of the mold and form a confined space within the mold. Steam pressure at about 40 pounds per square inch was now introduced within the mold by opening the valve (*n*). This steam resulted in softening the celluloid and also caused the end flanges of the blank to be forced outwardly by the pressure to seal the openings (*4* and *6*) referred to. I noticed, however, that in a number of cases, due perhaps to the

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lack of skill on the part of the workman, that this sealing was not effected and that the steam escaped through the openings in the top disk, so that the proper seal was broken and the blank had to be removed and either remolded to the proper shape or else rejected as worthless. When, however, the seal was properly effected, the steam was allowed to remain turned on, for perhaps a minute or more, until the blank had been thoroughly softened. This step is

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described in the Messer patent as follows:

"It is desirable to first soften the record cylinder, so that it may be expanded against the record surface of the matrix. In order to accomplish this, a heated fluid, preferably steam under about 50 pounds pressure to the square inch, is forced into the record chamber \* \* \*

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The steam is kept at a substantially uniform pressure within the record chamber, so as to, by means of its peculiar heating qualities and other actions, soften the record and force it out against the inner indented surface of the matrix." (p. 2 lines 7 to 22)

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After the steam had been turned on for a sufficient time to soften the blank and "force it out against the inner indented surface of the matrix," the steam was turned off by closing the valve (*n*) and was allowed to blow off from the apparatus through the exhaust valve (*y*), which was then closed, and compressed air was then admitted to the inside of the blank by opening the valve (*v*). Mr. Philpot informed me that the air pressure used was 100 pounds per square inch, but I had no means of verifying this statement since there were no gauges either on the air pipes or on the air tank. The Messer patent states that the air thus admitted to the interior of the blank is "cooled," and it also says that such air under pressure is permitted "to remain in the record chamber until such blank record is sufficiently cooled and hardened. Thus

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cooled and shrunk, it is easily removed without collapsing." (p. 2, lines 35 to 39). This statement in the Messer patent is not entirely clear, since it would appear therefrom that cool air under high pressure was allowed to enter the blank to expand it so as to take an impression from the matrix or mold, and that after such impression had been taken, the blank would contract *against the pressure* so as to shrink clear of the mold. I doubt if this could be done in practice; at any rate, it is not done at the

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present time by the Lambert Company in making its duplicate records. In the first place, the compressed air used by the Lambert Company is neither cold nor even cooled, but is quite hot, being heated not only by compression, but by the close proximity with the steam pipes, and due to the fact also that in entering the mold it passes through pipes already heated by steam. Of course if the air was allowed to blow off for a considerable time through the entrance pipe (*q*), it might become cool, but this is not permitted in the

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carrying out of the Lambert process, since the air enters the mold and has no escape therefrom during the expanding process. Consequently the duplicate within the mold, after the impression has been received thereon, is still very hot. The compressed air is now turned off and vented through the escape pipe (*s t*) and the top plate (*d*) is elevated, whereupon the mold with the record therein is removed from the apparatus. After this removal the duplicate record so formed is permitted to cool

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until it has contracted radially to a sufficient extent as to clear the engaging surfaces and permit its withdrawal. In no instance during my inspection of the Lambert Company's process was a record removed from the mold without first permitting it to shrink radially to clear the engaging surfaces. It is true that some of these records were removed while still quite hot by a series of canting or tilting operations, but this was done only when the record had shrunk sufficiently to give a noticeable clearance between the



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record and mold. The foreman of the shop informed me that in the removal of the records by thus forcibly pulling them up before they had shrunk completely, there was always danger of injuring the molds, and after removing a record in this way he called my attention to the fact that the mold was badly scratched and its quality seriously affected. At my suggestion the attempt was made to remove a record immediately

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after the impression had been received and while still in a heated condition, but the effort was unsuccessful, although the workman appeared to be exerting the greatest muscular effort to free it. That record was only removed after sufficient time had elapsed as to result in a radial contraction thereof sufficient to clear the engaging surfaces. While it is no doubt possible to remove these records while still more or less hot, it is not possible to remove them before they have contracted radially, and in every instance the most effective removal of the records would be secured when

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the radial contraction had progressed to the maximum extent. In no instance would it be possible to remove the Lambert records by collapsing them, because such records are so stiff and the end flanges are of such a character that they cannot be collapsed. It is true that these records are somewhat flexible and can be distorted slightly radially, but it will be seen that when such a record is distorted along one diameter, it will be expanded to the corresponding extent along its perpendicular diameter. In

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other words, the compression of a Lambert record at diametric points does not result in a reduction of its circumferential dimension, but that dimension remains the same however much the record may be compressed along one of its diameters. A molded record can be removed from the mold only when the circumferential dimension of that record is less than the corresponding dimension of the mold, so that the engaging surfaces are clear.

The process carried out at the present time by the Lambert Company in its Chicago factory embodies the



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same invention as the 17th claim of the Edison patent in suit and as the first claim of Lambert patent No. 645920. With that process a matrix or mold is first made by forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive and electrolytically depositing metal thereon. I saw these matrices actually made by this method, and the Messer patent states that the matrices are made by the method of the prior Lambert patent. The process carried out at the present time by the Lambert Company consists in outwardly expanding under pressure within the matrix a cylinder or tube of softened material. While the prior Lambert patent describes the softening of the material by a preliminary treatment as well as by heat during the process of expansion, the Messer patent describes the softening of the material by the application of heat after the blank has been inserted in the mold exactly as with the Edison process of the patent in suit. In this respect, therefore, the process as now carried out by the Lambert Company is even more closely allied to the Edison process than was the process of the prior Lambert patent which the Patent Office decided was patentably identical with that of Edison. With the process as at present carried out by the Lambert Company the cylinder or blank is "sufficiently thick to maintain its shape during and after the act of disengagement from the matrix." In fact, so far as I can determine, the records now made by the Lambert Company are identical with the records which that Company has always made. If the material which they now use is thinner than the material which they formerly used, that fact is not noticeable and does not affect in any way the question of identity between the process as now used by them and any process which they might formerly have used. With the process as now carried out by the Lambert Company, the duplicate record having been formed is contracted radially by allowing it to cool and is then withdrawn by a direct longitudinal movement. In this respect the pro-

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cess at present used by the Lambert Company is more closely allied to the Edison process than was the process of the prior Lambert patent. In fact the Lambert Company's present process is identical with that of the Edison patent in suit, since with both the resulting duplicate is contracted by a reduction in temperature and is then directly withdrawn, whereas in the case of the prior Lambert patent the shrinking of the duplicate was effected by immersing it in a solution of

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hydrochlorous acid and water. Notwithstanding the fact that the process of the prior Lambert patent was thus specifically distinguished from the process of the Edison patent, the Patent Office declared that the two processes were patentably identical. Although the process which the Lambert Company now employs differs in details from the specific process of the prior Lambert patent, yet every divergence between those two processes carries the present process nearer to the specific embodiment of Edison's

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invention covered by the patent in suit. If the process of the prior Lambert patent was patentably identical with Edison's process and the Patent Office so held, there can be no question but that the process at present used by the Lambert Company is identical with Edison's process. In fact, it would be possible to draw a claim on Edison's process which would be even more specific than the 17th claim of the patent in suit, which claim might not cover the process of the prior Lambert patent but would still cover the process as now actually used by the Lambert Company. In other words, it might be possible to draw a claim similar to the 17th claim of the Edison patent in suit which would be specifically limited to the step of contracting the duplicates by a reduction in temperature. Such a claim would not apply to the process of the prior Lambert patent, but would apply directly to the Edison process and to the process as now used by the Lambert Company.

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I have read the testimony of Mr. Philpot taken at Chicago on the 1st inst., and find that his description

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of the Lambert process does not agree with the process as now carried out by that Company. I do not understand that Mr. Philpot is a technical man, and presume his mistakes are attributable solely to lack of information. Mr. Philpot states (Q. 3) that cold air is used, and that "the cold air cools the celluloid phonogram." This is not so, but, as I have said, the

air is neither cold nor cooled, but is distinctly hot, and it does not cool the phonogram, since when the phonogram and mold are removed from the apparatus the former is quite hot. In the same answer Mr. Philpot states that when the phonogram "is cold it is collapsed sufficiently to enable us to force it out of the matrix." This also is not correct. Any amount of collapsing would

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not permit the duplicate to be removed, but it can be removed only when it has first contracted radially to clear the engaging surfaces, as suggested in the Edison patent in suit. In answer to Q. 15 Mr. Philpot states

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that the steam pressure used is about 30 pounds per inch. When I saw the process carried out the steam pressure was about 40 pounds per inch according to the gauge, and in the Messer patent it is stated that the pressure is 50 pounds per inch. Mr. Philpot also states (Q. 17) that the steam is kept on for about 20 seconds. My impression is that the steam treatment was continued for much longer than this—probably between one and two minutes—since a one minute hour glass appeared to be used, and the steam was allowed to be turned on some time after the sand had run out.

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In answer to x-Q. 54 Mr. Philpot intimates that it is necessary, in carrying out the process, "to collapse or bend the tube slightly to force it out of the matrix." I have pointed out that this is not so and that any amount of collapsing within the limits of a Lambert record would not assist the removal of the record from the mold, but that such removal can take place only when the record has contracted radially. In fact, in the Messer patent it is stated that when the record is "cooled and shrunk it is easily removed *without col-*



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*lapsing*" (p. 2 lines 38, 39). In x-Q. 55 Mr. Philpot was asked "What you considered as new in this process for the purpose of getting a patent on it was the use of cold air to both expand, cool and slightly shrink the celluloid phonogram, isn't that true?" The fact that Mr. Philpot answered this question affirmatively convinces me that he is not familiar with the process used by the Lambert Company at this time. Mr. Sheridan, who asked the question, was evidently under

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the impression that with the Lambert process the special steps of the Messer patent were carried out, and that the cooling and shrinking of the record took place while the compressed air was turned on. I have pointed out that this is not so and that the cooling and shrinking were effected exactly as with the Edison process after the expansion had been effected. Of course it would not make any difference, so far as the present case is concerned, whether the exact process of the Messer patent was carried out or not, since it is immaterial *when* the radial contraction takes place—whether when the duplicate is subjected to the effect of the compressed air or after such effect.

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In conclusion I express this opinion: The specific process described in the prior Lambert patent was held by the Patent Office to be patentably identical with the specific process described in the Edison patent in suit and covered by the 17th claim thereof. That 17th claim corresponds identically with the first claim of the Lambert patent. Although the two processes were

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thus held to be patentably identical, they differed in specific details to which I have referred. The process for making duplicate sound records now used by the Lambert Company is more closely allied to the process of the Edison patent in suit than was the process of the Lambert patent, and particularly since the contraction of the duplicates is effected by a reduction in temperature, whereas with the process of the prior Lambert patent the contraction of the duplicates was effected by immersing them in a solution of hydrochlorous acid and water. I believe, therefore, that the

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process now used by the Lambert Company is the exact equivalent of the Edison process and complies absolutely with all the conditions of the 17th claim of the patent in suit as well as of the first claim of the prior Lambert patent.

FRANK L. DYER.

Subscribed and sworn to before me this 27th day of July 1903.

[SEAL.]

JNO. ROB'T TAYLOR,  
Notary Public Kings Co. 1518  
Certificate filed in New York Co.

**Affidavit of H. C. Hecht, Jr.**

UNITED STATES CIRCUIT COURT,

NORTHERN DISTRICT OF ILLINOIS,

1519

NORTHERN DIVISION.

NATIONAL PHONOGRAPH COMPANY

vs.

LAMBERT COMPANY.

In Equity, No.  
26598.  
On Edison Patent  
No. 713209.

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**Affidavit of Henry C. Hecht, Jr.**

STATE OF ILLINOIS, }  
County of Cook, } ss.

HENRY C. HECHT, JR., having been first duly sworn, on oath doth depose and say as follows:

I am employed at the office of the National Phonograph Company, Chicago, Ill., and have charge of the



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general repair work on phonographs. On Thursday morning, July 23rd, 1903, I visited the factory of the Lambert Company at the corner of Jefferson and Monroe streets, Chicago, Ill., in company with Mr. Frank L. Dyer of New York City, and a Mr. Philpot, who, I am informed and believe, was A. D. Philpot, one of the officers of the Lambert Company. At the factory in question I witnessed the complete operation of manufacturing Lambert duplicate records, except such parts of the operation as I shall hereinafter refer to and concerning which I was informed by Mr. Philpot and the foreman of the shop.

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The moulds used by the Lambert Company for making duplicate standard phonograph records, as well as duplicate Concert or large size phonograph records, were constructed as follows: An original or master record was first mounted on a mandrel and rotated rapidly and a coating of very fine powdered graphite was applied to the surface of the rotated master by a swab of cotton wool, to which the graphite was applied. I did not see this operation performed, but it was described to me by Mr. Philpot. The coated master was then placed in a copper plating bath and was heavily plated with copper, after which the original master was removed from the deposited shell, and the latter was then placed in an iron jacket, the space between the shell and the jacket being filled with plaster paris. I saw a large number of these moulds at the Lambert factory.

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In the making of the duplicates the following steps were performed:

A long tube of celluloid about 1/16 of an inch thick, was first cut up into rough blanks of the desired length. I have marked one of these blanks with my name, and have designated the same "Exhibit A". These rough blanks were then formed with end flanges, by pressure and heat. I did not see this operation performed, but it was described to me by Mr. Philpot. I present one of these flanged blanks herewith, have identified it with my signature, and have marked the



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same "Exhibit B". The flanged blanks were then coated with a reddish or pinkish composition, of a secret nature, the purpose of which was described by Mr. Philpot as giving a smooth surface to the blank as well as to neutralize or overcome in some manner, the injurious effects of the oxide of zinc with which the celluloid is charged. After being thus surface treated, the blanks as I was informed by Mr. Philpot, were allowed to remain for three or four days until completely cured. I present one of these surface treated blanks herewith, have affixed my name thereto, and have marked the same "Exhibit C". After the blanks had been thus treated, they were given an imprint from the mould, in the following way: The mould was placed in a groove formed in a horizontal table or disc, so as to be properly centered thereon. A pipe passed up through said disc so as to discharge within the mould. A surface treated flanged blank was then inserted within the mould. An upper disc was then moved down upon the mould, so as to close its upper end, and said upper disc was blocked in this position by a wedge or cotter pin. Both the bottom table or disc and the upper disc were provided with a line of perforations communicating with the atmosphere and in line with the flanges on the blank, so that said flanges, when subjected to internal pressure, would close said openings so as to seal the same. Steam was then turned on inside of the blank so as to soften the material and tend to force it outwardly against the mould. Mr. Philpot stated that the steam pressure was 40 pounds per inch, and a steam gauge connected to the steam pipe confirmed this statement. After the steam had been turned on to the inside of the blank for possibly two minutes, the steam was turned off, and compressed air was admitted to the inside of the mould so as to further expand the blank into engagement with the mould. Mr. Philpot stated that the air pressure was 100 pounds per square inch, but I had no means of confirming this as there was no gauge on the air pipe, nor was there any gauge on the compressed air tank. This com-

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pressed air was kept on for a longer time than the steam treatment, but there appeared to be no definite time for this operation, since in some instances the air pressure was kept on longer than in others. I observed that the operator in charge of the moulding seemed to have a good deal of difficulty in carrying on these operations successfully, since in a number of instances the flanges of the blanks did not seal the line of vents referred to, but the steam was permitted to escape from such vents and get in between the blank and mould so as to thereby prevent any impression from being secured. In a number of instances the blank was so distorted in this way that they apparently had to be rejected as defective. After the impression had been successfully made from the mould, the upper disc was elevated so as to permit the mould and duplicate therein to be removed. The record was then allowed to remain for some time until it had contracted sufficiently to permit it to be longitudinally withdrawn.

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In some instances it was possible to remove the duplicate longitudinally by a series of canting operations, the record being moved back and forth in the mould and being in this way gradually removed while still quite hot, but it was never possible to thus remove a duplicate until the latter had cooled sufficiently to be loose from the mould. In fact, the foreman of the shop, who seemed to be the most expert person present, tried, at Mr. Dyer's request, to remove a duplicate immediately after the impression had been secured, but he was unsuccessful in doing this and had to wait some time until the duplicate had become loose from the mould, whereupon it was removed as explained. The foreman of the shop also stated that when the attempt was made to remove a record longitudinally by a series of canting or tilting operations, great care had to be exercised to prevent the duplicate from scratching and ruining the mould. Of course if the duplicate was allowed to cool down to atmospheric temperature so as to shrink still more, there would be no danger whatever of the mould being injured, since the duplicate in that case would

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probably drop out by its weight. In no instance was a record removed by collapsing it, but in every instance the duplicate was removed by first permitting it to contract radially and by then withdrawing it by a direct longitudinal movement. It would, in fact, be impossible, with duplicates made by the Lambert Company, to collapse them so as to be removed, since, if such records were collapsed along one diameter, they would expand to the same extent along the perpendicular diameter. In other words, with such records, any attempt to collapse them would not result in a diminution in their circumferential dimensions. Such records could be, and in every instance were, removed only when their circumferential dimension had been reduced by cooling to a sufficient extent as to permit a separation of the engaged surfaces and allow their direct longitudinal removal. I present herewith a duplicate record which was made in the presence of Mr. Dyer and myself, as the same was removed from the moulds, and have marked it "Exhibit D", and identified the same with my signature. After the record was thus formed with an impression thereon, its ends were reamed out in a lathe, to gauge, whereupon the record was complete. I present herewith a record made in the presence of Mr. Dyer and myself, which was thus completed, and marked same "Exhibit E" and have identified it with my signature.

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At the time of my visit to the Lambert Company, Mr. Philpot stated to Mr. Dyer and myself that his Company was making about 300 duplicates per day at the present time, but that its plant had facilities for making 2,500 duplicates per day. He also stated that the processes and apparatus used at the present time by the Lambert Company were those which are described in the Messer patent of July 29th, 1902.

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HENRY C. HECHT, JR.

Subscribed and sworn to before me this 24th day of July, A. D., 1903.

SAM'L. POWELL.

*Notary Public.*

[SEAL]



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**Second Affidavit of Frank L. Dyer.**

UNITED STATES CIRCUIT COURT.

NORTHERN DISTRICT OF ILLINOIS.

NORTHERN DIVISION.

1538

NATIONAL PHONOGRAPH COMPANY

vs.

LAMBERT COMPANY,

In Equity.  
No. 26598 On Edi-  
son Patent No.  
713209.

**Second Affidavit of Frank L. Dyer.**

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STATE OF ILLINOIS }  
County of Cook } ss.

FRANK L. DYER, having been first duly sworn on oath,  
doth depose and say as follows :—

I have already made an affidavit in this case, verified  
July 27, 1903.

The circumstances under which I came to visit the  
factory of the Lambert Company and of my visit to  
that factory on July 23rd, 1903, were the following :—

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On July 1, 1903, my brother Richard N. Dyer, of  
counsel for complainant herein, obtained a deposition  
from Albert D. Philpot, secretary of the defendant  
corporation and in that deposition Mr. Philpot stated  
in effect that with the process as carried on by the  
Lambert Company at that date, and since the grant of  
the Edison patent in suit, the duplicate records, in  
order to be removed from the mould, required to be  
slightly collapsed before withdrawing them. During  
the course of Mr. Philpot's re-direct examination, he  
was asked if the company would permit an expert to

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examine its process and he agreed to that suggestion, but stated (R. D. Q. 66) that his factory was shut down at that time but would be open about July 10, 1903. My brother therefore returned to New York and told me of the proposition that he had made and requested me to make arrangements to visit the Lambert Company. I therefore had some correspondence with Mr. Philpot on the subject, and he suggested, as I now remember it, that I should make my visit on July 23, 1903, which I did.

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When I went to the Lambert Company's factory, I found things more or less disorganized, and the operations seemed to be carried on in a desultory way. There seemed to be only two or three employees around, in addition to the foreman. No one, so far as I could see, was working in the matrix department, nor was any one engaged in forming the tubular celluloid into the necessary blank form for introduction into the matrices. In fact, the only work that was being done was in connection with the duplicating operation, *per se*, and this work was confined to the duplication of standard records and did not include the duplication of the so-called "Concert records" of large diameter. There seemed to be one man at work operating the duplicating machines, and he was assisted by one or two boys.

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When we entered the factory, Mr. Philpot introduced Mr. Hecht and myself to the foreman, and those two gentlemen explained the process to us, commencing with the tubular celluloid in its original form. When we reached that part of the operation that relates to the taking of impressions from the matrices the foreman practically took charge and performed those operations for us. As I have said in my first affidavit, after the impression was taken, the matrix, with the duplicate record therein, was placed to one side and allowed to cool somewhat, and the record forcibly removed by a series of canting operations, but this was done before the duplicate record had become entirely cold. I knew, of course, that it would be

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In Equity.  
No. 26598 On Edi-  
Patent No.  
3209.

L. Dyer.

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examination, he  
an expert to



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mechanically impossible to separate the duplicate record from the matrix before the former had contracted diametrically, and in fact, as I stated in my first affidavit, I requested the foreman to try to remove a duplicate immediately after the impression was taken, but he was unsuccessful in doing so, although he exerted, apparently, all of his muscular effort in the attempt. At the same time I accepted the demonstration which was made for me as having been made in

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good faith, although, of course, I saw that the removal of the duplicate records, after they had contracted diametrically, although probably not enough to permit them to drop out by their own weight, was a full and complete embodiment of the invention of the patent in suit. I realized, however, that if the duplicate records were allowed to cool to the normal temperature, or were artificially cooled below the normal temperature, they could be allowed to drop out of the matrix without any danger of injuring either the record or the

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matrix surface. In fact, I state in my first affidavit that the foreman of the factory called my attention to the fact that in removing a duplicate record as he was doing for me, there was always danger of injuring the matrix surface. Consequently, no one in his senses would think, for a moment, of removing the duplicate records from the matrices while the former were hot, but would always wait until the complete shrinkage had taken place.

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I have read the depositions of Alfred C. Rustad, Joseph Bloom and Thomas B. Lambert taken in this case, and find that the special demonstration which was made for me on July 23, 1903, instead of being a faithful representation of the process which the Lambert Company commercially carried out, was in the nature of an imposition on me.

According to the testimony of both Rustad and Bloom, with the process as carried on by the Lambert Company since the date of the patent in suit, and up to July 18, 1903, the duplicate records, after the impression has been taken, have been allowed to cool



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completely so that when the matrix is elevated, the record will drop out by its own weight. Mr. Rustad states that the time allowed for the cooling of the duplicate records was about half an hour (Q. 14). Both Rustad and Bloom say that in no instance in the commercial carrying on of the Lambert process was the duplicate record removed in any other way, and Mr. Lambert confirms my opinion that with records of the Lambert type it would be mechanically impossible to remove them solely by collapsing the records, but that in every instance the records must be allowed to first shrink or contract diametrically, so as to separate the engaging surfaces, and permit the duplicate to be removed. 1550

In my original affidavit, I call attention to the fact that with the Messer patent of July 29, 1902, covering the apparatus which the Lambert Company uses, the statement is made that the record is "cooled" and is allowed "to remain in the record chamber until such blank record is sufficiently cooled and hardened. Thus cooled and shrunk, it is easily removed without collapsing." 1551

Since making my former affidavit, two additional patents have been granted to the Lambert Company, as assignee of Thomas B. Lambert, also covering their process and apparatus, namely, patents Nos. 742454 and 742455. In both of these patents the statement is made that "The cooling of the record-cylinder also shrinks it, so that it can be easily removed from engagement with the matrix." (Page 2, 2nd Column.) 1552

FRANK L. DYER

Sworn to and subscribed before me this 7th day of November, A. D. 1903.

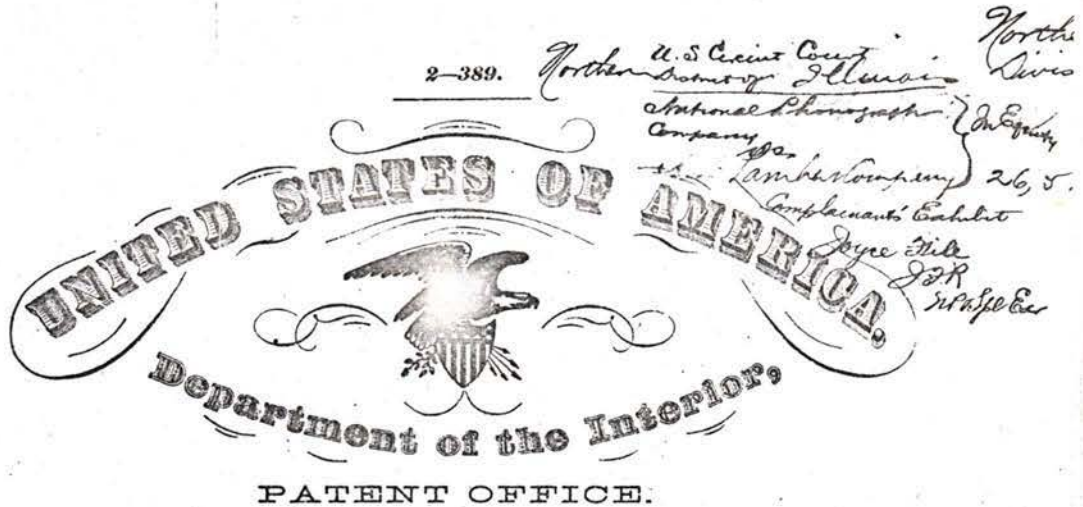
WM. H. ARTHUR  
Notary Public

[SEAL]

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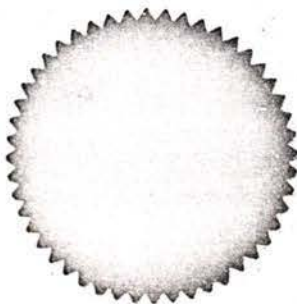






To all persons to whom these presents shall come, Greeting:

This is to certify That the annexed is a true copy from the  
 Records of this office of the *File Wrapper*  
 and Contents up to and including  
 Office Letter of October 16, 1902, also Drawing  
 in the matter of the  
 Application of  
 Maurice Joyce  
 Filed October 13, 1897, Serial Number 1655,027  
 for  
 Improvement in Duplicating Phonographs.



In testimony whereof I have hereto set my hand and  
 caused the seal of the Patent Office to be affixed at  
 the City of Washington this *eleventh* day  
 of *April*, in the year of our Lord  
 one thousand nine hundred and *four*  
 and of the Independence of the United States of  
 America the one hundred and twenty-eighth.

*P. J. Allen*

Commissioner of Patents,



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## P E T I T I O N .

To the Commissioner of Patents:

Your petitioner Maurice Joyce a citizen of the United States, residing at Washington D. C. ~~in the County of, State of~~ prays that Letters-Patent may be granted to him for the improvements in Duplicating Phonograms as set forth in the annexed Specification.

And he hereby appoints WALLACE A. PARTLETT, of Washington, District of Columbia, attorney with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the Patent, to sign the drawings, and to transact all business in the Patent Office connected therewith.

Maurice Joyce

## S P E C I F I C A T I O N .

To all whom it may concern:

BE IT KNOWN, That I, Maurice Joyce, residing at Washington, D. C. ~~in the County of, and State of~~ have invented certain new <sup>Methods of</sup> and useful improvements in Duplicating Phonograms of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to the method of and means for duplicating or multiplying phonogram cylinders.

The object of the invention is to reproduce fac similes of phonogram cylinders in as large numbers as may be desirable, and these cylinders are reproduced according to this invention, in the manner hereinafter set forth.

Figure 1 is a side elevation of a phonogram, with metallic end connections, ready for application to an electro deposition apparatus.

Figure 2 is a broken cross section of a phonogram, and one of the metallic end pieces and connections. Figure 3 a face view of one metallic end piece.

Figure 4 is a <sup>broken</sup> longitudinal section of metallic mold or shell.

Figure 5 a section of mold with all parts assembled and duplicate phonogram or wax therein.

The cylinder or phonogram to be reproduced by this invention is the usual form of hollow wax cylinder, or it may be a conic frustum, having the characters impressed or indented in its outer surface. I take such a cylinder, and make a metallic contact with both ends. Thus A, indicates the original phonogram. B, is a copper or other metallic piece, having a hollow base or cup, and a flat disk like a cup bottom against which the end of the phonogram is applied. The edge of this cup is made tapering, as at B'.

The cap, C, is somewhat similar to the base B, but as it is not necessary that this cap shall contain the retaining nut, no recess is required. The outer edge of this cap tapers at C', and the disk face rests against the end of the phonogram blank. A metallic rod, D, passes through both end pieces B and C, and all the parts are held firmly in contact by the nuts D' engaging threads on this rod.

The upper end of the rod D has a metallic head E, to which the wire ~~or wires~~ from an electric battery or machine are connected in usual manner, as by binding screw F.

The parts having been assembled as in Fig. 1, a close fitting wax joint is made between the wax phonogram A, and the metallic ends B and C, and the surface of the phonogram, <sup>and the end pieces are</sup> black-leaded.


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W. A. B.  
May  
5/48

The phonogram and the metallic end pieces are then placed in a bat-

tery <sup>for electro deposition</sup>. The end B may rest on ~~a metal piece, or other surface,~~ at the bottom of the battery to insure good contact. The battery fluid should come at least to the top of the cap C and preferably extend above the same. By usual means of electro deposition, copper or other metal may now be deposited, and a hollow cylinder can thus be made with its inner surface in contact with every part of the phonogram. An exact reproduction, in reverse, of the phonogram is thus made on the shell. This metallic shell I call a mold. The flaring or rounded metallic end pieces B and C form with the cylinder a surface on which metal may be readily deposited. 

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5/48

After the metal shell or mold had been obtained, the parts are disconnected, and the wax phonogram cylinder A is melted or removed, leaving the copper or metal mold H, Fig. 4 with the phonogram in reverse on its inner surface.

The mold H is made with tapering or flaring ends, for the purpose of affording a mouth into which melted wax can be poured. One flaring end is cut off the mold, but by having two flaring or cupped ends, that one can be selected which is most desirable. After cutting off one of the ends, the outside of that end of the mold is trued up in a lathe to exactly fit a base or holder, I, in which a holding cup is made. Or if an exact fit be not made, the mold H may be held in base I by filling of wax or plaster, so that the mold is held firmly.

A tapering core, K, preferably tubular, has one end cylindrical and screw threaded, and this screw threaded end enters a socket in the base piece I, so that the core is exactly central of the mold H.

W. A. B.

*slightly oiled and then*

474

The mold, core, and base are heated, preferably to near the temperature of melted wax; this heating expands mold H slightly. Then melted wax, L, is poured into the hot mold, and fills the space between the mold H and the core K.

After the wax has been poured it will generally have the exact form of the mold when cool; but under certain circumstances the wax cast may be subjected to pressure in any of the usual ways. A hydraulic, pneumatic, or other pressure may be applied to the wax column, as is done in casting metals. A good way to apply pressure however, is to wait until the wax has partly set, and then screw down the tapering core into its base I. This not only compresses but expands the wax outwardly, insuring that all parts of the mold are impressed into and reproduced by the wax.

The mold and contents may now be cooled, by immersing all in a bath of cold water. Or cold water may be passed through the hollow core K, or other cooling means may be employed. The cooling of the wax, which is of usual phonogram compound, causes it to shrink away from mold H, and the wax duplicate phonogram can now be removed from the end of the mold, the shrinkage being great enough to permit this removal without injury to the phonogram record.

By a repetition of the molding process, multiplied copies can be obtained to any extent.

The core is preferably withdrawn from the mold with the phonogram adhering thereto. Then the core may be removed, and the ends of the phonogram dressed up, so that the new phonogram is an exact reproduction of the original. Of the core may be permanently left in the phonogram.

I have described a method and mechanisms for carrying the same into effect, in the best manner known to me. It must be understood that I avail myself of the mechanical knowledge available in the electrotypers and allied arts, and that where equivalent steps are known I contemplate their use also. My invention is as broad as my claim. Where I have indicated a wax phonogram, it must be understood as applying to a phonogram of plastic material. When I refer to blackleading, other conductive materials used as an equivalent in the electrotypers' art may be used instead of graphite. My duplicates may be made of any fusible substance used for phonograms, provided the shrinking of the material or the expansion of the metallic shell permit the withdrawal of the duplicate from the mold.



What I claim is:

1. The method of duplicating or multiplying phonogram cylinders, which consists in enclosing a wax phonogram between metallic end pieces, blackleading, and electro-depositing a metallic shell on said phonogram and ends, removing the phonogram, completing a mold of which said shell forms the cylindrical wall, casting a wax cylinder in said mold under pressure, cooling the wax casting so that it shrinks from the shell, and withdrawing the wax casting endwise from the shell, to be finished for use as a phonogram, substantially as described.

2. The method of forming a cylindrical mold for phonograms, which consists in enclosing a phonogram cylinder between metallic end pieces, coating with <sup>a</sup>conductive substance, electro-depositing a metallic shell on said cylinder and end pieces, and afterward removing the end pieces and the phonogram, substantially as described.

*Cancelled  
July 16/00*

3. The method of forming duplicate cylindrical phonograms, which consists in securing an electro-deposited cylindrical record mold of the phonogram, casting and compressing a fusible duplicate in said mold, cooling said duplicate to shrink the same from the mold, and withdrawing the said duplicate from the end of the cylinder, substantially as described.

4. The method of forming duplicate phonograms, which consists in producing a hollow cylindrical shell or mold containing the reversed record, heating said shell, casting a fusible phonogram in the hot mold and cooling the same to shrink it from the mold, and withdrawing and finishing the phonogram, substantially as described.

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5. The hollow seamless cylindrical metallic mold for phono-  
grams having the reverse phonogram record on its interior, and pro-  
vided with a flaring end or pouring mouth, substantially as des-  
cribed.

Invent  
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may  
5/98

3 6. The seamless cylindrical metallic phonogram mold having  
reverse record on its inner face, the base piece having a recess  
to receive said mold, and the tapered core supported by said base  
piece so as to permit a longitudinal movement of the core and ex-  
pansion of the phonogram thereby, all combined substantially as  
described.

Sub.  
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4 7. The cylindrical phonogram mold, the socketed base piece  
having a screw thread therein, and the tapered core with a screw  
thread engaging said base-piece, in combination substantially as  
described.

5/5/98

8. The <sup>integral, seamless</sup> cylindrical phonogram mold, having reverse phonogram  
record, the base piece, and a hollow tapered core supported by said  
base piece, all combined substantially as described.

anceled  
July 16/00

8 9. The cylindrical metallic mold having reverse phonogram  
record, the base piece having a socket for said mold, the core, and  
means for compressing the wax or compound between said core and  
mold, all combined substantially as described.

Invent  
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Invent  
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Invent E  
July 16, 00



In testimony whereof I affix my signature in presence of two witnesses.

Thomas J. Staley  
W. A. Bartlett.

Maurice Joyce

O A T H.

Dist of Columbia

Maurice Joyce the above-named petitioner, being duly sworn (or affirmed), deposes and says that he is a citizen of the United States and resident of Washington, D.C. that he does verily believe himself to be the original, first, and sole inventor of the Improvements in Duplicating Phonograms described in the foregoing specification; that he does not know and does not believe that the same was ever known or used prior to his invention thereof, and that the same has not to his knowledge been in public use or on sale in the United States for more than two years prior to this application; that the same has not been patented to him nor to others with his knowledge or consent, in any country.

Maurice Joyce

Sworn to and subscribed before me this 12th day of October 1897

(Notarial Seal)

Thomas J. Staley  
Notary Public.

UNITED STATES PATENT OFFICE,

Washington, D. C., April 12, 1898.

HON. COMMISSIONER OF PATENTS:-

It is respectfully requested that the application of Maurice Joyce, # 655,027, filed October 13, 1897, and allowed Dec. 24, 1897, be withdrawn from issue for the purpose of interference. The final fee has not been paid.

Respectfully,

J. T. Newton

Examiner of Division XXIII.

Approved Apr. 11 1898  
A. P. Greeley  
Assistant Commissioner.

CASE  
WITHDRAWN FROM FILES OF  
ISSUE AND GAZETT DIVISION  
April 11 1898 JWB

P. J Q

Div. 221  
 "The Commissioner of Patents."  
 Washington, D. C.  
 J. H. D.

2-260.

Paper 2, Rej.

All communications respecting this  
 application should give the serial number,  
 date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C. May 3, 1898.  
 Mailed " " "

Maurice Joyce,  
 Care Wallace A. Bartlett,  
 City.

Please find below a communication from the EXAMINER in charge of your application.

for Duplicating Phonograms, filed October 13, 1897, serial number  
 555,027.

G. H. Duell

*G. H. Duell*  
 Commissioner of Patents.

This application has been withdrawn from issue for the purpose of interference. Upon re-examination however it is found that the description of the electric connections for the electro deposition is not clear. It appears from Figure 1 that both wires of the battery are connected to the same binding post, in which case there would be no current flowing through the liquid. It is not seen why the end B rests on a metal piece or other surface at the bottom of the battery as stated. If this piece has metallic connections with the vessel containing the liquid, it would seem that the current would be short circuited through this piece and then through the base piece B to the post D, and to the binding post, in which case the current would not flow through the liquid. Further explanation is required.

Claim 5 is rejected on the patent to Edison, #484,582, October 13, 1892, in Acoustics, Graphophones. This patent describes a seamless cylindrical metallic mold for phonograms having the reverse phonogram record on its interior. It does not however seem to be provided with a flaring mouth although it forms a mold and the wax or wax like material is poured therein. There would be no invention in providing this mold with a flaring end or pouring mouth. As showing that it is common to provide molds with

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pouring mouths, applicant's attention is directed to Black, #35,359 May 27, 1862, in Candle Apparatus.

Claim 8 is rejected on the patent to Edison cited. In lines 75 to 78, it is stated that the duplicate phonograms are produced by means of the described mold "by pouring therein and preferably around a suitable core placed in the mold." It is noted that this claim calls for a tapered core supported by a base piece. There is no doubt in the Examiner's mind that Edison had some sort of base piece for supporting his mold and it is believed that the core referred to would naturally, in view of the use to which it is put, be tapered. In any event, it is held that to taper said core would not involve invention.

As at present advised, the remaining claims may be allowed.

In view of a probable interference, applicant is required to amend this case within a period of thirty days from the date of this action, or on or before June 2, 1898. Should the amendment not be made at that time, the interference will either be declared under Rule 96, or the interfering application passed to issue as the circumstances of the case may warrant.

J. T. Newton

S. F.

cat  
guy

In re Joyce, No. 655,027, filed Oct. 13, 1897.

Duplicating Phonograms.

Please erase one wire from post E, Fig. 1.

Page 2, line 17, cancel "6r wires"

Page 3, line 2, cancel "a metal piece, or other surface at".

Page 3, add to line 12:

"The means for electro depositing are old and well known. I assume no special novelty therein, except perhaps for a convenient means of holding a phonogram for use in a battery":

Claim 4, line 3, after "mouth" insert:

*cancelled* "a ~~tapering plunger~~ in said mold, and means for moving said ~~plunger~~ <sup>1/4" c</sup> plunger lengthwise, in combination",

Claim 8, line 1, before "cylindrical" insert:

"integral, seamless",

The figure (1) shows a wire with the end projecting at both sides of the binding post. As a matter of fact the end of the wire often projects, and was so copied, but as it is apt to be misleading it would be better to cancel the wire at one end. Two wires may be used from different machines, but must be from same poles of batteries.

While Joyce had a special arrangement of base piece, the description was not full enough to bring this out, and any old battery will do the work. The description is therefore amended to state this fact.

The Edison patent cited had never the combination covered by claim 4 as amended, and by claim 8. That is, Edison made a seamless mold, and then destroyed it before he assembled the elements to make his combination, by sawing the mold into segments. As he had in mind only a mechanical expansion of the mold to remove the phonogram, he was compelled to do this in order to remove his phonogram. In any other way his device would be inoperative. Thus while Edison might have made the combination if he had discovered a way of removing the phonogram without cutting the mold, he does not in the patent cited described such a combination as a seamless mold with a movable plunger to work therein.

Reconsideration is asked on the case as amended.

May 5th, 1898.

Respectfully, W. A. Bartlett



1481

2-266.

Form No. 221.  
 All communications should be addressed to  
 The Commissioner of Patents,  
 Washington, D.C.

Paper 4, Rej  
 All communications respecting this  
 application should give the serial number,  
 date of filing, and title of invention.

J. H. D.

DEPARTMENT OF THE INTERIOR.

## UNITED STATES PATENT OFFICE,

Maurice Joyce.

WASHINGTON, D. C. May 19, 1898.

Mailed

Care Wallace A. Bartlett,

City.

Please find below a communication from the EXAMINER in charge of your application.

for Duplicating Phonograms, filed October 13, 1897, serial number:  
 655,027.

C. H. Duell

*C. H. Duell*  
 Commissioner of Patents.

This application has been reconsidered as amended  
 the 5th instant.

The wire connecting the battery to the post D which was  
 ordered erased has not been erased for the reason that no blue-  
 print has been filed in the case. When said blue print is filed,  
 the erasure will be made. Inasmuch as these changes have been  
 required, the expenses will be borne by the office.

Claim 5 in its present form is thought to be allowable,  
 Applicant's attention is directed to the fact however that  
 this claim is substantially the same as claims which have been  
 allowed in applicant's other application.

Claim 8 is rejected on the patent to Edison of record. As  
 has been stated, Edison employs a base piece and a core, and in  
 view of the use to which the record is to be put, it is believed  
 that the core employed would be tapered; in any event, there  
 would be no invention in forming it with the taper. It is noted  
 that this claim calls for an integral seamless cylindrical mold.  
 It is thought that applicant's invention resides in the method by  
 which the phonogram blank is expanded and separated from the  
 matrix. This being true, it is immaterial whether the matrix is  
 integral and seamless or whether it is formed in the manner  
 described in the Edison patent; in other words, by taking the  
 Edison apparatus and apply<sup>ing</sup> heat to the phonogram blank,  
 applicant can produce the same result as he can with the  
 apparatus recited in this claim.

In view of the interference previously referred to;  
 applicant is again given thirty days in which to amend his appli-  
 cation.

J. T. Newton  
 Ex.

S.E.F.

er 4, Rej  
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 could give the serial number,  
 and title of invention

19, 1898.

your application.

97, serial number:

H. Duell

Allen  
 Commissioner of Patents.

ed amended

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 Newton  
 Ex.

Commissioner of Patents:

In re Joyce. No. 655,027, Oct. 13, 1897.

Duplicating Phonograms.

Add claim 10:

10. The cylindrical, seamless mold having reverse pho-  
 nogram record on its inner surface, the core, and means for  
 compressing the wax or compound between the said core and  
 seamless mold, and for withdrawing the phonogram so produced  
 from the end of the seamless mold, substantially as described.

It is held that, whether Edison had a tapering plunger  
 or not, he never made the invention of using such plunger in  
 a way to produce practical results, by expanding a blank into  
 a seamless mold. If he had the idea of such expansion, why  
 did he spoil the mold by cutting it into sections? It is not  
 "immaterial" whether the mold be seamless or not. A seam-  
 less mold is the only practical mold. Applicant has made  
 the invention, not only in the process, but in the mechanism.  
 Mr. Edison rather vaguely suggests means for using his mold,  
 after it has been divided, but he makes no suggestion of us-  
 ing it in its seamless shape-the only way in which it can  
 be made to produce practical results.

Suppose applicant is able to use blanks which may be ex-  
 panded mechanically or chemically and which will contract to  
 its original size, and still retain the phonogram impress-  
 ions. Applicant clearly contemplated such a modification  
 when he stated page 5, of his original specification:



"My duplicates may be made of any fusible substance used for phonograms, provided the shrinking of the material or the expansion of the shell permit the withdrawal of the duplicate from the mold".

Applicant therefore insists on his former claims, and to avoid any doubt as to his belief in the scope of the invention adds a claim, substantially the old 9th, but omitting an element which may possibly be superfluous. On this presentation, applicant acts final action. Should the examiner repeat the rejection of claim 8 or object to the new claim, interference need not be delayed, unless such claim is one of the points involved in the interference, as the question of patentability can be later settled by the ~~the~~ appellate tribunal. Interference may be declared under Rule 96.

It is believed, however, that the examiner must recede from his position that Edison describes this combination, - the seamless mold, the tapered plunger and means for moving the tapered plunger to expand the blank into the mold, or in fact any means or mechanism by which a blank can be expanded or compressed into a seamless mold. 21

Please reconsider.

Respectfully,

W A Bartlett

Attorney for Joyce.

May 20, 1898.

2-260.

Div. ~~First~~ 221  
in communications should be addressed to  
"The Commissioner of Patents,  
Washington, D. C."

Paper No. 6,  
All communications respecting this  
application should give the serial number,  
date of filing, and title of invention.

J. H. D.

DEPARTMENT OF THE INTERIOR,  
UNITED STATES PATENT OFFICE.

WASHINGTON, D. C. May 26, 1898.  
Mailed " " "

Maurice Joyce,  
Care Wallace A. Bartlett,  
City.

Please find below a communication from the EXAMINER in charge of your application  
for Duplicating Phonograms, filed October 13, 1897, serial number  
655,027.

C. H. Duell  
*C. H. Duell*  
Commissioner of Patents.

This application has been reconsidered in view of  
applicant's argument filed the 21st instant.

Claim 8 which was previously rejected on <sup>a</sup>reference and for  
the certain reasons is upon reconsideration thought to be  
allowable.

Claim 10 which was presented in the amendment above refer-  
red to is objected to. There are no means shown in this application  
for withdrawing the phonogram from the end of the seamless  
mold as stated. When this objection is cured, this case will be  
in condition for allowance as at present advised.

It is thought that this application will not be in the inter-  
ference which has been referred to..

J. T. Newton  
Ex.



588

Commissioner of Patents:

In re Joyce, No. 655,027, filed Oct. 13, 1897.

Duplicating Phonograms.

Cancel claim 10, and insert:

le.  
 cancelled  
 July  
 28/98

10. A hollow cylindrical seamless mold having reverse phonogram record on its inner surface, a core, and means for compressing the wax or compound between the said core and seamless mold, so that the phonogram may be reproduced by pressure and withdrawn from the end of the seamless mold when the relative proportions of mold and phonogram have been changed, substantially as described.

Add claim:

le.  
 cancelled  
 July  
 28/98

11. The method of duplicating phonograms, which consists in securing a seamless hollow cylindrical mold with reverse phonogram on its inner surface, introducing a plastic material into said mold and reproducing the phonogram on the external surface of said material, changing the relative size of the mold and the plastic material, and withdrawing the phonogram so made from the end of the cylindrical mold, substantially as described.

The suggestion of the examiner as to claim 10 seems to be warranted and the claim has been changed accordingly.

In view of the decision of the Court of Appeals in Hill v. Hodge, 83, O. G. 1211, a broad generic claim is added.

It is true that under the Rules such a claim might properly have been earlier in the case, but the developments of the art, of the court decisions, and of the Office practice have been such as to afford some excuse for the inadvertence of the attorney in presenting more limited claims than the invention warrants. It is requested that the broad claim submitted be now considered.

Respectfully,

W A Bartlett

Attorney for Joyce.

May 27th, 1898.

J. H. D.

DEPARTMENT OF THE INTERIOR,

*United States Patent Office,*

*Washington, D. C., June 4, 1898., 190--*

U. S. PATENT OFFICE  
JUN 8 1898  
EX'R OF INTERFERENCES.

Maurice Joyce,

Care Wallace A. Bartlett,

City.

Interference No. 19,545

Please find below a copy of a communication from the Examiner concerning your application for Duplicating Phonograms, filed October 13, 1897, serial number 655,027.

Very respectfully,

C. H. Duell

Room No. 221

All communications should be addressed to  
"The Commissioner of Patents,  
Washington, D. C."

*C. H. Duell*  
Commissioner of Patents.

Your case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules

The statement demanded by Rule 110 must be sealed up and filed on or before the 29th day of June 1898, with the subject of the invention. The interference number should also be indorsed thereon, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count 1

The process of duplicating phonograms having phonographic record thereon, which consists in forming a matrix or mold wherein the original record will be reproduced, in loosely engaging a blank phonogram with said mold or matrix, and in finally intimately engaging the blank phonogram with said matrix or mold by changes of temperature.

This is substantially claim 10 of your application #671,178, and includes the patentable subject matter of claims 2 and 3 of the application of Thomas A. Edison of Llewellyn Park, N. J.

Count 2

The method of duplicating phonograms, which consists in securing a hollow cylindrical mold with reverse phonogram on its inner surface, introducing a plastic material into said mold and reproducing the phonogram on the external surface of said material, changing the relative size of the mold and the plastic material, and withdrawing the phonogram so made from the end of the cylindrical mold.

This is substantially claim 11 of your application #655,027 and includes the patentable subject matter of claim 10 of the same application, claims 1, 2, 3 and 4 of your application #671,

178, and claims 7, 8, 9, 11, 12 and 13 of Edison, whose attorney is R. N. Dyer of 31 Nassau Street, New York, N. Y.

J. T. Newton

S.E.F.

Ex.



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221  
The Commissioner of Patents,  
Washington, D. C.  
J. H. D.

Paper 9. Rej.

An communication respecting this  
application should give the serial number,  
date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C. June 30, 1898.

Mailed " " "

Maurice Joyce,

Care Wallace A. Bartlett,

City.

Please find below a communication from the EXAMINER in charge of your application,  
for Duplication Phonograms, filed October 13, 1897, serial number  
655,027.

C. H. Duell

Commissioner of Patents.

The interference #19,545, entitled Edison vs.

Joyce, in which this application is involved, has been suspended  
for the purpose of citing some newly discovered references.

Claims 3 and 4 are each rejected on the English patents to  
Lioret, #23,366, of 1893, in Acoustics, Graphophones, and No. 1478  
of 1894 in Graphophone Tablets. It is noted that these claims  
call for the casting of the duplicate in the mold which has been  
formed, while each of these references disclose the process of  
inserting a blank into the mold. Both patents however describe  
the mold which applicant uses and the process of casting in molds  
being old, it is held that as broadly as is claimed, there would  
be no invention in using the mold described in these patents for  
casting.

Claim 5 is also rejected on the patent to Lioret cited. If  
the mold which is shown in Figure 8 were used for casting,  
there would certainly be no invention for providing said mold  
with a pouring mouth such for instance as is shown in the patent  
to Black of record.

Claim 8 is rejected on the patent to Lioret of record.  
There would be no invention in making the core shown in this  
patent hollow.

English  
Claims 10 and 11 are each rejected on the patents above cited.

In view of the interference, applicant is given 30 days  
within which to amend this application. If it be not so  
amended within this time, the interference will either be declared  
or the interfering application passed to issue as the circum-  
stances will seem to warrant.

S.R.F.

J. T. Newton  
Ex.

amended  
July 14/98

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9. Rej.

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and title of invention.

30, 1898.

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H. Duell

Commissioner of Patents.

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Commissioner of Patents:

In re Joyce, No. 655,027, filed Oct. 13, 1897.

Duplicating Phonograms.

Please cancel claims 10 and 11, and insert:

10. A hollow cylindrical, seamless, metallic mold having reverse phonogram on its inner surface, a movable core within the same, means for casting a fusible compound between the core and mold, and for changing the relative area of the mold and fusible cast cylinder, so that the casting can be removed directly from the end of the mold, all substantially as described.

11. The method of duplicating phonograms, which consists, in obtaining a tubular cylindrical mold with reverse phonogram on its inner surface, introducing a tubular fusible cylinder therein, expanding the tubular cylinder to receive the phonogram, then relatively changing the diameter of the mold and phonogram cylinder by heat changes, and withdrawing the phonogram so made by direct longitudinal movement from the end of the mold.

In English patent 1748 of 1894, it is apparent that only a very thin cylinder could be used, such as a thin sheet of celluloid, since such cylinder must be collapsed or folded for withdrawal. The expansion of the mold or contraction of the cylinder by heat did not occur to this patentee. The only reference to heat is a warming temperature, to soften the celluloid sleeve.



Patent 23,366 of 1893, is somewhat more explicit, but a careful consideration thereof convinces the attorney that this device could never have been operative. The fact that no such device is known on the market sustains this view. The phonogram was to be on a spiral thread. This necessitates the "galvanoplastic" mold must be screw threaded, and the re-produced phonogram like unto it. It is out of the question to expand or contract a "galvanoplastic" shell to the extent of the spirals. Therefore the reproduced phonogram must be screwed out of the mold, and this it is believed must destroy the phonogram. Even if it did not do so, the method could only be utilized for slow and painful reproductions, as the screwing part is detrimental. It is thought the method never has been introduced because it could not be. At any rate the patentee does not show or describe what is now claimed.

It is held that the references do not apply to claims 3, 4, and 5 and 8, as such claims are limited beyond the references. For instance, claim 3 is limited to "casting and compressing" in the mold. The references mention no such step. Claim 4 includes "casting"- not in reference. Claim 5 is for a precise construction in which a flaring mouth is used. Now it will be admitted that the flaring mouth itself involves not much invention, yet in view of the grave doubt that the reference shows an operative device it is thought even this slight variation is sufficient to differentiate. Claim 8, to a hollow core, introduces an element not found, and of great utility under certain circumstances, as it permits a water circulation.

This element is doubtless old per se, but new in this combination.

In view of the fact that the references are devices of doubtful operativeness, it is thought they should not be insisted on unless the claims absolutely present the same elements shown in the references. It is believed such is not the fact.

Very respectfully,

W A Bartlett

Attorney for Joyce.

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2-260.

Div. 1<sup>st</sup> 221

Communications should be addressed to  
The Commissioner of Patents,  
Washington, D. C.

Paper 11. Rej

All communications respecting this  
application should give the serial number,  
date of filing, and title of invention.

J. H. D.

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE.

WASHINGTON, D. C. Aug. 10, 1898.

Mailed " " "

Maurice Joyce,

Care Wallace A. Bartlett,

City.

Please find below a communication from the EXAMINER in charge of your application  
for Duplicating Phonograms, filed October 13, 1897, serial number  
655,027.

C. H. Duell

*C. H. Duell*

Commissioner of Patents

This application has been reconsidered in connection  
with applicant's argument and amendment of the 28th ultimp.

Claims 3 and 4 are again rejected on the references and for  
the reason of record.

As an additional reference showing that it is common  
to employ molds in similar relations to that recited in this  
claim, applicant's attention is called to the patent to Edison  
#414,761, Nov. 12, 1889, in Acoustics, Graphophone Tablets. Appli-  
cant's mold being old in the English patents of record to use  
said mold for casting in the manner shown in Edison would not  
involve invention.

Claim 5 is rejected upon the English patent to Lioret of  
record, taken in connection with the patent to Edison or Black  
cited.

Claim 8 is rejected on the English patent to Lioret of record.  
While it may be desirable to use a hollow core in order that a  
stream of cold water may be conducted through the same at the same  
time the principle of conducting water through parts for the  
purpose of keeping them cool is old and well recognized and <sup>it</sup> would  
not involve invention to make the core shown in the English  
patent hollow for this purpose.

Claim 10 is rejected on the references and for the reasons  
given in connection with the rejection of claim 3. It is held



that in the patent to Licret of record the casting is removed "directly from the end of the mold".

Claim 11 is rejected as reciting a method which has no foundation in this application. In so far as the specification and claims previously in the case are concerned, this application has been confined to the method of casting. If applicant regards the method set forth in this claim merely as a modification of the method recited in the previous claims, his attention is called to the fact that there is no divisional line between this and applicant's other application #671,178, February 2, 1898. This claim is further rejected on the references and for the reasons given for the rejection of claim 3.

In view of the interference previously referred to, applicant is again given 30 days within which to amend this application.

Wm. J. Rich Acting Examiner.

S.E.F.

Commissioner of Patents:

In re Joyce, No. 655,027, filed October 13, 1897.

Duplicating Phonograms.

Please cancel claims 3, 4, 5, 8, 10 and 11, renumber remaining claims, and add claims:

*E* ~~6. The method of duplicating phonogram cylinders, which consists in procuring a metallic electro-deposit mold in form of a hollow cylinder having reverse copy of the phonogram, casting a fusible hollow cylinder in said mold, cooling said hollow cylinder so that it shrinks from the mold, and removing the cylinder from the end of the mold, substantially as described.~~

*Cancelled per J.* ~~7. The method of forming duplicate hollow cylindrical phonograms, which consists in securing a hollow cylindrical mold having on its inside the reverse characters of said phonogram, casting and compressing a fusible compound into the mold, cooling the same to shrink it from the mold, and withdrawing the duplicate from the end of the mold, substantially as described.~~

~~8. The method of duplicating phonograms, which consists in securing a hollow cylindrical metallic reverse mold of the phonogram, forming a hollow plastic composition in the mold, expanding the plastic into the mold by internal pressure, and shrinking and removing the cylinder from the mold, substantially as described.~~

July 14, 1900.

Very respectfully,  
W A Bartlett,  
Attorney for Joyce

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W A Bartlett,  
Attorney for Joyce

2-260.

DIV. Room 219.  
All communications should be addressed to  
"The Commissioner of Patents,  
Washington, D. C."

Paper No. 13 Letter

All communications respecting this  
application should give the serial number,  
date of filing, and title of invention.

492

590

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE,

Maurice Joyce,

WASHINGTON, D. C., July 28, 1900.

Mailed " " "

Care W. A. Bartlett,

City.

Please find below a communication from the EXAMINER in charge of your application,  
for Duplicating Phonograms, filed Oct. 13, 1897, No. 655,027...

C. H. Duell

*C. H. Duell*

Commissioner of Patents.

The claims directed to be entered as Nos. 5, 6 and 7  
have been entered as 6, 7 and 8.

Claims 3, 4 and 5 are drawn to certain apparatus, and the  
remaining claims to a process. Applicant is required to divide  
between these two sets of claims in accordance with Rule 41.

R.H.S.

J. T. Newton  
Ex.

Commissioner of Patents:

In re Joyce, No. 655,027, filed Oct. 13, 1897.

Duplicating Phonograms.

It is respectfully submitted that the application complied  
with the Rules at the time of filing. A change of Rules which  
affects the status of such an application before the Office is  
in the nature of an ex-post facto law, and it is believed no such  
Rule can apply to an application pending prior to the promulgation  
of the Rule

Please reconsider.

Very respectfully,

W A Bartlett,

Attorney for Joyce.

June 26, 1901.



493

594

2-260.

Div. 219  
All communications should be addressed to  
"The Commissioner of Patents,  
Washington, D. C."  
J. H. D.

Paper No. 15, Letter  
All communications respecting this  
application should give the serial number,  
date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., July 13, 1901.  
Mailed " " "

Maurice Joyce,

Care Wallace A. Bartlett,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of your application,  
for Duplicating Phonograms, filed October 13, 1897, serial number  
655,027.

*F. I. Allen*  
Commissioner of Patents.

Applicant's argument filed the 25th ult., has been duly  
considered. The point raised as an issue by applicant's argument  
was decided in the case of Ex parte Farquhar, C. D., 1899, p. 205  
and accordingly the requirement of division as made July 28, 1900  
must be insisted upon and made final.

J. T. Newton

Ex

JH.L.

7.  
10/18/02

No. 16

Amendment 7

2/18/02

The Commissioner of Patents:

In re Joyce, No. 655,027, filed Oct 13, 1897.

Duplicating Phonograms.

Page 1, line 1, please cancel "and means for"

Page 3, line 1, after "mold" insert: "or matrix"

Page 4, line 21, after "record" insert: "by direct longitudinal movement of the phonogram".

Cancel claims after claim 2 and insert:

3. The method of producing phonograms, which consists in taking a hollow cylindrical metallic mold with reverse record on its inner wall, casting a hollow cylinder of plastic material in the mold, then cooling and shrinking the hollow phonogram thus produced to release the record from the mold, and withdrawing it from the mold.

7. 4. The method of producing phonograms which consists in taking a hollow metallic cylindrical mold with reverse record on its inner wall, casting or molding a hollow plastic cylinder within said mold so as to have the casting take the record, releasing the plastic cylinder or phonogram so formed by change of temperature between the mold and phonogram, and removing the phonogram from the mold.

10/18/02 5. The method of producing hollow cylindrical phonograms which consists in obtaining a mold having a reverse phonogram record on the inner wall of a cylindrical opening, forming a hollow cylindrical plastic phonogram within said mold, releasing the phonogram from the mold by a difference of temperature between the mold and phonogram sufficient to entirely clear the surfaces, and removing the phonogram from the mold by direct longitudinal movement.

15, Letter  
respecting this  
the serial number,  
the of invention.

1901.  
"

your application,  
7, serial number

Allen  
Commissioner of Patents.

has been duly  
licant's argument  
1899, p. 205  
July 28, 1900

on



<sup>5</sup>  
~~6~~ The method of producing phonograms which consists in taking a hollow cylindrical mold with reverse phonogram record on its inner wall, inclosing a hollow tubular mandrel therein, molding a plastic phonogram between the mold and mandrel, releasing the phonogram from the mold by change of temperature and withdrawing the phonogram from the mold.

<sup>6</sup>  
~~7~~ The method of producing phonograms which consists in taking a hollow cylindrical mold with a reverse phonogram record on its inner wall, inclosing a mandrel in said mold, molding a phonogram of plastic material in the mold and securing face contact between the mold and plastic by pressure on the plastic material, and releasing the phonogram from the mold by change of temperature.

<sup>7</sup>  
~~8~~ The method of producing phonograms which consists in taking a hollow cylindrical mold with reverse phonogram record on its inner wall, inclosing a hollow mandrel in said mold, forming a phonogram of plastic material in said mold, and shrinking the mandrel and phonogram to release the record from the mold by cooling <sup>and</sup> withdrawing the mandrel and phonogram.

*Insert 14*

*Insert*

*34*

-----o-----

The claims are now confined to the various steps of the method involved, applicant reserving the right to file a divisional application on the mechanism.

The method, so far as relates to the production of the phonogram, differs from references cited principally as follows:-  
 Young, one of the English references, states that he collapses his phonogram to withdraw it from the mold. This must apply to both a method and a material decidedly different from that of Joyce. A phonogram on a mandrel could not collapse. Joyce's

phonograms could not be collapsed and afterward rendered useful. It is quite certain that Young's method, if operative, is quite different from that of Joyce.

Lirret uses a matrix which precludes the withdrawal of the phonogram except in spiral direction. He does not cast or mold a phonogram. He does in part release the record by change of temperature, but in part he "unscrews" the phonogram, which is an unnecessary feature with the improved construction of Joyce. Lirret does not state when or how he withdraws his mandrel from the celluloid phonogram. He does not use a hollow mandrel, and therefore does not have the change of temperature so fully under control as does Joyce. He cannot shrink the mandrel and phonogram together, thus liberating the record. The only pressure he provides for his celluloid ring is internal pressure. Joyce provides for both internal and end pressure. There are many and substantial differences between the two processes as set forth.

It is not thought that molding of candles, as referred to in an early reference, is pertinent. A molded candle can be drawn directly from the mold, but it has no finely engraved surface to be presented, and the mold and molded article do not require to be separated so as to disengage the interlocking surfaces of the machine and its product.

The claims have been carefully worded so as to cover only the improvements this inventor has made, and can not be read in the references without departing from the plain text of the references.

Please reconsider.

Very respectfully,

W A Bartlett,

Attorney for Joyce.

February 18, 1902.



197

598

2-260.

Div. .... Room 219  
All communications should be addressed to:  
"The Commissioner of Patents,  
Washington, D. C."

Pat. No. 17,263  
All communications respecting this  
application should give the serial number,  
date of filing, and title of invention.

J. H. D.

DEPARTMENT OF THE INTERIOR,  
UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., March 8, 1902.  
Mailed " " "

Maurice Joyce,

Care Wallace A. Bartlett,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of your application,  
for Duplicating Phonograms, filed October 13, 1897, serial number  
655,027.

*F. J. Allen*  
Commissioner of Patents.

This action is taken in view of the amendment filed the  
18th ultimo.

Claims 3, 4, 6, 7 and 8 are rejected in view of the  
patent of Lioret, October 30, 1894, #528,273, graphophones.

Claim 5 is allowed. Action within fifteen days from  
date is required in view of prospective interference proceedings  
under Rule 96.

J.H.L.

J. T. Newton

Ex

Argument

3/10/02

Commissioner of Patents:

In re Joyce, No. 655,027, filed Oct. 13, 1897.

Duplicating phonograms.

Applicant does not for amoment concede that a process which consists in casting a melted or dissolved material into a matrix is the equivalent of a method which consists in expanding a cylinder already molded or otherwise formed into a matrix. The processes are as unlike as casting a chilled car wheel tread on to welding a forged tire.

Further than this, applicant has discovered that the expansion and contraction of the material he uses, under changes of temperature, is sufficient to release the phonogram from the matrix, without any such awkward expedient as the formation of a matrix and its product with a screw thread. The fact of improvement if not of originality, is emphasized by the knowledge that no such device as that of Lioret has ever been seen on the American market, although phonograms may be found by the million.

It is therefore contended that the reference, Lioret, does not anticipate claim 3, because Lioret does not cast a hollow cylinder in the mold (matrix). He does not anticipate claim 4, because so far as appears he has no casting, and he certainly does not make a casting to take the record. Lioret does not anticipate claim 6, because he does not use a hollow mandrel, which gives vastly greater facility for expansion and contraction by change of temperature. He does not anticipate claim 7 because he uses only one of the two methods of securing certainty of definition pointed out by Joyce, viz. expansion while Joyce casts the cylinder in the mold (matrix) and for

certainty of results, expands the casting also. Lioret does not anticipate claim 8 because he cannot contract a solid mandrel as Joyce does a hollow mandrel.

Applicant declines to further limit his claims in view of the reference cited, and asks reconsideration.

Very respectfully,

W A Bartlett

Attorney for Joyce.

March 10, 1902.

No. 17 Rej  
ations respecting this  
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Div. 219

All communications should be addressed to  
"The Commissioner of Patents,  
Washington, D. C."

Paper No. 12 Letter

All communications respecting this  
application should give the serial number,  
date of filing, and title of invention.

J. H. D.

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., March 25, 1902.

Mailed

Maurice Joyce,

Care Wallace A. Bartlett,

Washington, D. C.

Please find below a communication from the EXAMINER in charge of your application,  
for Duplicating Phonograms, filed October 13, 1897, serial number  
655,027.

*F. J. Allen*  
Commissioner of Patents.

This action is taken in view of the argument filed the  
10th instant.

The claims are considered allowable but official action  
must be suspended for the period of fifteen days under Rule 96,  
at the expiration of which period of time, applicant is requested  
to call this case up for action.

J. T. Newton

J.H.L.

Ex

No. 20

Amndt. 4g.

6/10/02

Commissioner of Patents:-

In the application of M. Joyce, No. 655,027, filed Oct. 13,  
1897, Method of Duplicating Phonograms.

Please add the following claim:

9. The method of producing hollow cylindrical phonograms,  
which consists in obtaining a mold having a reverse phonogram  
on the inner wall of a cylindrical opening, forming a hollow  
cylindrical plastic phonogram within said mold, releasing the  
phonograms from the mold by a radical contraction of the phono-  
gram sufficient to entirely clear the surface, and withdrawing  
the phonogram from the mold by direct longitudinal movement.

It is requested that the case be taken up for consideration.

Respectfully,

W A Bartlett

Attorney for Joyce.

No. 12 Letter  
indications respecting this  
should give the serial number,  
date, and title of invention.

ch 25, 1902.

of your application,  
1897, serial number

*J. Allen*  
Commissioner of Patents.

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Newton

No. 20  
*Amndt. 4g.*  
*6/10/02*

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ttorney for Joyce.

Forwarded from Div. to  
Examiner of Invs. Invs.

2-213

Paper No.

[INTERFERENCE.]

J. H. D.

DEPARTMENT OF THE INTERIOR,

*United States Patent Office*

*Washington, D. C.* June 24th  
Mailed " " "

B  
No. 21  
137  
with 205  
142 204  
284 & 1134

Maurice Joyce,  
Care Wallace A. Bartlett,  
Washington, D. C.

U. S. PATENT OFFICE,  
RECEIVED  
JUN 14 1902  
DIVISION 23.

21893

Please find below a copy of a communication from the Examiner concerning your

application for Duplicating Phonograms, filed October 13, 1897, ser.  
number 655,027, (Case A)

Very respectfully,

*From No. 219*  
The Commissioner of Patents,  
Washington, D. C.

*F. J. Allen*  
Commissioner of Patents.

Your case, above referred to, is adjudged to interfere with others, hereafter specified,  
and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up, and filed on or before the  
15th day of July, 1902, with the subject of the invention  
and name of party filing it, indorsed on the envelope. The subject-matter involved in the  
interference is

Count 1.

The method of producing hollow cylindrical phonograms,  
which consists in obtaining a mold having a reverse phonogram  
record on the inner wall of a cylindrical opening forming a hollow  
cylindrical plastic phonogram within said mold, releasing the  
phonogram from the mold by a radial contraction of the phonograms  
sufficient to entirely clear the surfaces, and removing the  
phonograms from the mold by direct longitudinal movement.

(Case A)

The foregoing count is your claim 9, and is claim 2 of  
an application of Thomas A. Kaison of Llewellyn Park, New Jersey,  
for Processes of Duplicating Phonographs, whose attys. of record  
are Dyer, Edmonds & Dyer, #31 Nassau Street, New York, New York,



501

602

#655,027.

and claim 1 of an application of Eldridge R. Johnson of Philadelphia, Pa., for Process of Duplicating Sound Records, whose atty. is Horace Pettit, # 1012 Stephen Girard Building, Philadelphia, Pa.,

Count 2.

The method of producing hollow cylindrical phonograms which consists in obtaining a mold having a reverse phonogram record on the inner wall of a cylindrical opening, forming a hollow cylindrical plastic phonogram within said mold, releasing the phonogram from the mold by a reduction in temperature sufficient to entirely clear the surface, and removing the phonogram from the mold by direct longitudinal movement.

The foregoing count is your claim 5, (Case A);

Edison's claim 3 and Johnson's claim 2.

7

J. T. Newton

Ex

JHL

2-260.

Div. 219

All communications should be addressed to J. H. D.  
The Commissioner of Patents,  
Washington, D. C.

Page No. 22, Fin. Rej

All communications respecting this  
application should give the serial number,  
date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., October 16, 1902.

Mailed

Maurice Joyce,

Care Dyer, Edmonds &amp; Dyer,

# 31 Nassau Street,

New York, N.Y.

Please find below a communication from the EXAMINER in charge of your application,  
for Duplicating Phonograms, filed October 13, 1897, serial number  
655,027.

G. I. Allen  
Commissioner of Patents.

Claims 5 and 9 of this application are finally rejected  
under Rule 132, in view of the adverse decision in interference  
#21,893.

L.

J. T. Newton.

Ex

R. Johnson of Philadel-  
and Records, whose atty.  
ing, Philadelphia,

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and removing the phono-  
movement.

m 5, (Case A);

J. T. Newton

Ex

Page No. 22, Fin. Rej  
communications respecting this  
should give the serial number,  
ing, and title of invention.

October 16, 1902.

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, 1897, serial number

J. Allen  
Commissioner of Patents.

are finally rejected  
on in interference

(Serial Number)

655027

1897.

Patent No.

Maurice Joyce

Of Washington

County of

State of District of Columbia

Invention

Duplicating Phonograms

Parts of application filed	(Petition)	Oct 13, 1897.
	(Affadavit)	" " "
	(Specification)	" " "
	(Drawing)	" " "
	(Model)	none required
	( <i>Print</i> Specimen)	
	(First fee Cash \$15 Oct. 13-97-	
	( " " Cert.	

App. filed complete Oct 13 97

2 Examined Dec. 24 1897 J. T. Newton Ex

Countersigned: J W Babson

For Commissioner.  
Notice of allowance December 28, 1897.

Final fee Cash 189 .

" " Cert. , 189 .

Patented , 189 . "

3 F. L. Dyer  
Edison Laboratory  
Orange,  
N. J.

Wallace A. Bartlett  
City.

DIV. XXIII  
(Ex'r's Book,)

101  
2052



503

NUMBER(SERIES OF 1900)  
66-5027

DIV. 23  
(Ex'r's Book)

1897  
1901

101  
2052

PATENT No.

Name Maurice Joyce  
Assor to National Phonograph Company, of Orange, N. J. a corp of N.J  
Assignee  
of Washington  
County of  
State of District of Columbia  
Invention

Duplicating Phonograms

ORIGINAL.

PARTS OF APPLICATION FILED.  
(Petition Oct 13 1897, 190  
(Affidavit " " " , 190  
(Specification " " " , 190  
(Drawing " " " , 190  
(Model or Specimen Not req'd , 190  
*Print*  
(First Fee Cash \$15 Oct 13/97 190  
( " " Cert , 190  
(App. filed complete Oct 13/97 , 190

Examined , 190

Countersigned For Commissioner.

Notice of Allowance , 190

Final Fee Cash , 190

" " " , 190

Patented

Associate Attorney *Wm. Edwards Joyce* Attorney Wallace A. Bartlett  
Address *21 Madison St. New York City* Address Washington, D. C  
Name *Wm. Edwards Joyce* Serial Number 655027  
Patent No *Orange, N. Jersey* Date of Patent  
Joyce 655027

DIV. 23

r's book)  
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5-2

131 ACOUSTICS  
GRAPHOPHONE

1897

CONTENTS-

Application / paper.

1. Letter of Withdrawal Apr 12, 98
2. Rej. May 3, 1898
3. *Amndt. A. May 5/98*
4. Rej. May 19, 1898
5. *Amndt. B. May 21/98*
6. Letter May 26, 98
7. *Amndt. C. May 28/98*
8. Int. <sup>101</sup>2052 and <sup>137</sup>205 with <sup>142</sup>282 <sup>June 4</sup>1898
9. Rej. June 30, 1898
10. *Amndt. D. July 28/98*
11. Rej. Aug. 10, 1898
12. *Amndt. E. July 16, 00*
13. Letter, July 28, 1900.
14. *Letter June 25/01.*
15. Letter, July 13/01
16. *Amndt. F. Feb. 1902*
17. Rej Mch 8/02
18. *Argument Mar 10/02.*
19. Letter Mch 25/02
20. *Amndt. G. June 10/02*
21. <sup>137</sup>205 <sup>142</sup>282 <sup>204</sup>1134 1902 B
22. Final Rej Oct 16/02
- 23.

*further actions on big file*

TITLE:

Method of  
Improvement in ^ Duplicating  
Phonograms.

lace A. Bartlett  
ton, D. C  
Number 655027  
Patent



Fig. 1.

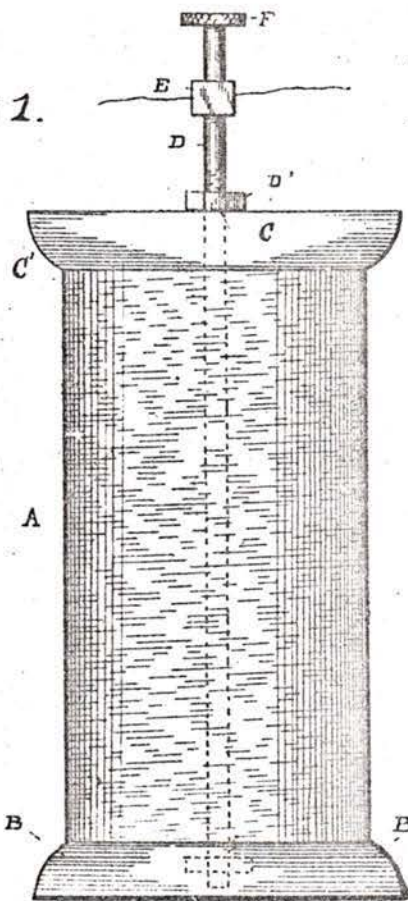


Fig. 4.

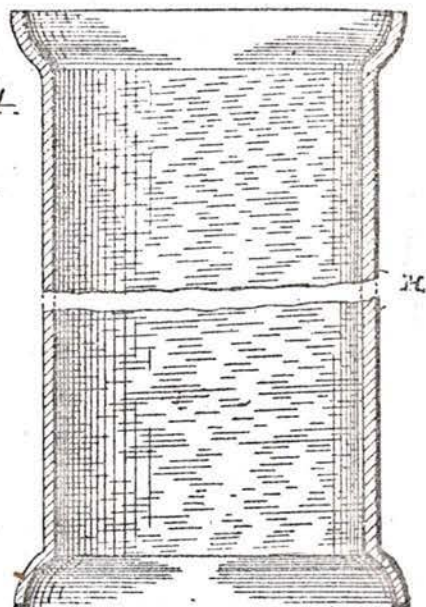


Fig. 3.

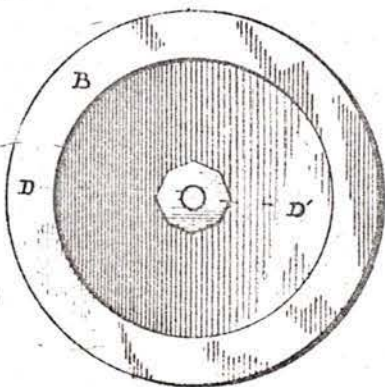


Fig. 5.

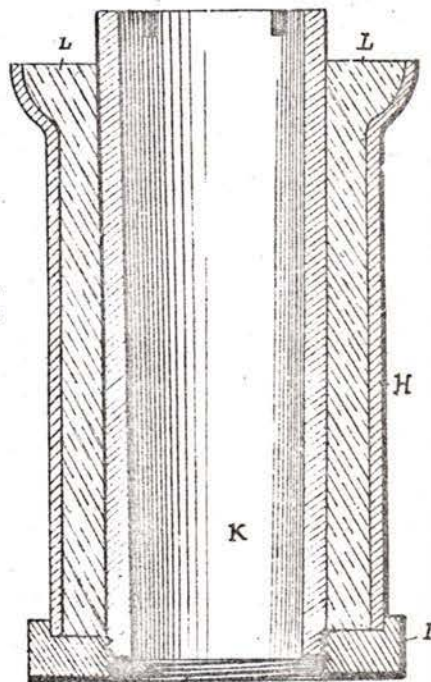
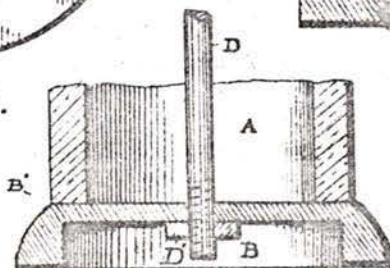


Fig. 2.



Witnesses

Chas. K. Knies

E. A. Lyman

Inventor

M. Joyce

By W. A. Bartlett

Attorney

Passed for Issue Dec. 24/1884



2-389.

U. S. Circuit Court  
Northern District of Illinois  
Northern Division  
National Phonograph Company, Inc. vs. Lambert Company  
Exhibit  
No. 24, 598  
Complete Exhibit  
File  
J. H. McSpencer



To all persons to whom these presents shall come, Greeting:

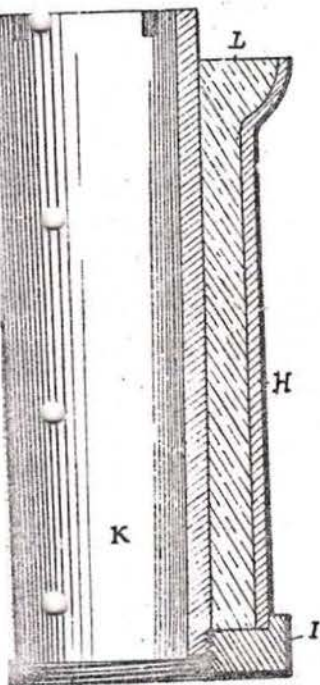
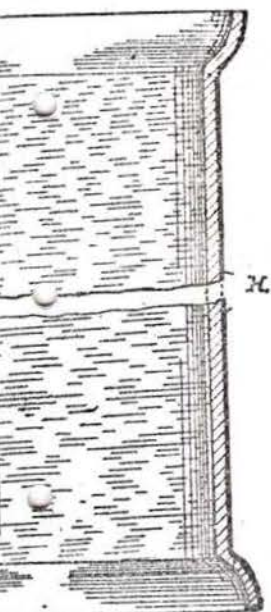
This is to certify That the annexed is a true copy from the  
Records of this office of the File Wrapper  
and Contents in the matter of the  
Letters Patent granted  
Thomas B Lambert, Assignor of Three-fifths  
to Brian F. Philpot and Joseph Powell,  
March 20, 1900, Number 645,920,  
for  
Improvement in Methods of Reproducing  
Phonograph Records.

In testimony whereof I have hereto set my hand and  
caused the seal of the Patent Office to be affixed at  
the City of Washington this 7<sup>th</sup> day  
of July, in the year of our Lord  
one thousand nine hundred  
and of the Independence of the United States of  
America the one hundred and twenty-fifth.



C. H. Druell  
Commissioner of Patents.

15928h10m3-1900



Inventor

M. Joyce

By H. A. Bartlett

Attorney

52

H. O.

For Issue Dec. 24



507

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AMOUNT RECEIVED

\$ 15.00  
ck

CHIEF CLERK.

P E T I T I O N .

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To the Commissioner of Patents:

Your petitioner Thomas B. Lambert a citizen of the United States residing at Chicago in the County of Cook and State of Illinois prays that Letters Patent may be granted to him for the Improvement in <sup>*Process for Producing for Phonographs*</sup> ~~Record Cylinders and Methods of Producing the same~~ set forth in the annexed specification.

2/16/99

Registration No. 1369

And he hereby appoints Messrs. Banning & Banning & Sheridan (composed of Ephraim Banning and Thomas A. Banning and Thomas F. Sheridan), of Marquette Building, Chicago, Illinois, his attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the Patent, and to transact all business in the Patent Office connected therewith.

Signed at Chicago in the County of Cook and State of Illinois this 11th day of August 1899

Thomas B. Lambert

BANNING & BANNING & SHERIDAN,  
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## O A T H .

STATE OF Illinois )  
COUNTY OF Cook ) ss.

Thomas B Lambert,

the above-named petitioner, being duly sworn, deposes and says that he is a citizen of the United States and resident of Chicago, Cook County, Illinois and that he verily believes himself to be the original, first, and sole inventor of the Improvement in Record Cylinders and Methods of producing the same described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof; or patented or described in any printed publication in the United States of America or any foreign country before his invention or discovery thereof or more than two years prior to this application; or in public use or on sale in the United States for more than two years prior to this application, and that no application for foreign patent has been filed by him or his legal representatives or assigns in any foreign country, except as follows:

Thomas B. Lambert

Sworn to and subscribed before me, this 11th day )  
of August, A.D. 1899.

(Notarial Seal;)

Annie C. Courtenay,

Notary Public.

Certificate on file in Patent Office.



TO ALL WHOM IT MAY CONCERN:--

be it known that I, Thomas

B. Lambert, a citizen of the United States, residing at Chicago, Cook County, Illinois, have invented certain new *Process for Producing* and useful Improvements in Record-Cylinders for Phonographs *and Methods of Producing the same*, of which the following is a specification.

My invention relates to that class of mechanisms which is styled "record cylinders" and which is adapted to be used in connection with phonographs and similar instruments - that is, instruments adapted to be operated for the purpose of vibrating a diaphragm and imitating speech and musical notes. The invention relates particularly to a cylinder and the material of which it is formed so as *to increase longevity by the use of material* to render it practically *infrangible* ~~indestructible~~; and, further, to the means, methods, or processes by which this and duplicate cylinders may be produced - all of which will more fully hereinafter appear.

The principal object of my invention is to provide a simple, economical and efficient method for constructing *infrangible* ~~indestructible~~ record cylinders. A further object of the invention is to provide a record cylinder of such material as to render it practically *infrangible* ~~indestructible~~; and the invention consists in the methods, features, combinations and details of construction hereinafter described and claimed.

In the drawings, Figure 1 is a vertical sectional elevation of a bath containing an electrolytic solution adapted to electrically form a matrix by which a record cylinder for phonographs may be produced, showing other elements attached, as will be more fully hereinafter explained; Fig. 2 a plan view of a completed matrix; and Fig. 3 a perspective view of a completed record cylinder.

In the art to which this invention relates, it is well known that it is desirable to produce a record cylinder of such nature and construction as will make it practically indestructible; and, further, to provide means and methods by which such a cylinder can be economically and efficiently formed, and ~~once formed be~~ duplicated in quantities, as desired. To these features my invention principally relates.

In forming a record cylinder, I first take and make an impression upon a wax cylinder A - see Fig. 1, in which the wax cylinder is in the bath - in an ordinary phonograph, then remove this wax cylinder from the phonograph and provide it <sup>at one end</sup> with a coating of carbon B, or other electric conducting material. I next place this cylinder in an electrolytic bath, having first surrounded and connected it with a metal ring C, which is supported on a metal rod D by means of a wire d and connected with the negative pole of a dynamo E. This cylinder with its attached mechanism is then placed, as above suggested, in the electrolytic bath which <sup>brings</sup> ~~places~~ it in circuit with the anode G



10/22/99 *or other metal* of copper, hung by means of a metal wire *g* upon a metal rod H and connected with the other pole of the dynamo. The dynamo being started, the copper is electrically deposited upon the carbon-coated wax cylinder, and, after it has reached the desired thickness, forms a copper cylinder ~~X~~, which is then removed from the bath and disconnected from the dynamo. The wax is next shrunk, by means of cold application, so that the copper cylinder may be removed therefrom. These operations form a copper cylindrical matrix B', the inner cylindrical surface of which contains a counterpart of the impressions on the wax cylinder.

It is desirable now to produce the indestructible record cylinders from this copper matrix in quantities as desired. To accomplish this result, the matrix is placed inside of a metal ring <sup>I</sup> ~~X~~, considerably larger in diameter than the matrix, and the space between the same filled with type metal I', which securely locks the matrix in position and furnishes a firm backing for same. I next

take a soft ring of cellulose or vulcanized rubber K and place it within the cylindrical opening of the matrix, and, by means of pressure - hot air or steam - force it out to its largest diameter and against the indented inner surface of the matrix, thus forming a counterpart of same and a record similar to that on the original wax cylinder. The cellulose ring is then permitted to harden, which it does rapidly, and shrinks or is shrunk in diameter by a reducing solution formed of hydrochloric acid and water,

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B'

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Invent  
B.  
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11/22/44 <sup>10/16</sup> of the tube <sup>the cellulose tube</sup> so that it can be removed from its engagement with the  
 matrix. When it has become dried and hardened, it forms  
 a cylinder K, as shown in perspective view in Fig. 3, pref-  
 erably of cellulose and which is practically <sup>infrangible</sup> ~~indestructible~~.  
 I prefer to use cellulose ~~as~~ for this purpose, in that it  
 is easier to manufacture and more durable in operation,  
 though the same method may be used for forming cylinders  
 of different materials.

Invent  
 B'  
 11/22/44

B'



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I claim:--

1. The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, then placing the cylinder so recorded and indented in an electrolytic solution and electrically depositing the metal thereon to form the matrix, then placing a cylinder of relatively soft material within the matrix and subjecting it to pressure to obtain indentations of the matrix, substantially as described.

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2: The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of relatively soft material - such as wax - then coating such material with carbon or other electric conducting material, then placing the cylinder so coated and recorded in an electrolytic bath and electrically depositing the metal thereon to form the matrix, then shrinking the soft cylinder to remove the electrically deposited matrix, then backing such matrix to form a matrix mold, then placing a cylinder of relatively soft material - such as cellulose - within the matrix and subjecting it on its inner surface to pressure to obtain the counterpart of the indentations in the matrix, then immersing such matrix and cellulose ring in a reducing bath to remove the record cylinder therefrom, and then drying and hardening such cylinder, substantially as described.

3. A practically indestructible record cylinder

formed of cellulose or similar material, substantially as described.

Thomas B. Lambert

WITNESSES:

Thomas F. Sheridan

See in every application for a patent filed subsequent to December 31, 1907, responsive action must be made by the inventor within one year after the last office action or the case will become abandoned.

2-246.

Room No. 23

All communications should be addressed to  
"The Commissioner of Patents,  
Washington, D. C."

J.H.D.

All communications respecting this  
application should give the serial number,  
date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,

## UNITED STATES PATENT OFFICE,

WASHINGTON, D. C.,

Sept. 20, 1899.

Mailed

Thomas B. Lambert,

Care Banning &amp; Banning &amp; Sheridan,

Marquette Building,

Chicago, Ills.

Please find below a communication from the EXAMINER in charge of your application. for  
Record-Cylinder for Phonographs and Method of Producing the Same,  
filed Aug. 14, 1899, Serial Number 727,183.

C. H. Duell  
Commissioner of Patents.

The process set forth in this application is believed to be  
inoperative and the claims are rejected on this ground. The  
Examiner is not acquainted with any form of cellulose that is ca-  
pable of being treated in the manner described, with the result  
attributed to it by applicant.

It is also thought the last two lines of page 3, are an error  
as a solution of hydrochlorous acid and water is not known to  
have the effect of shrinking cellulose.

Applicant will be required to demonstrate the operativeness  
of his process before any claims thereon can be allowed.

RULE 73. In every amendment the exact word or words to be stricken out or inserted in the application must be specified  
and the precise point indicated where the erasure or insertion is to be made. All such amendments must be on sheets of paper  
separate from the papers previously filed, and written on but one side of the paper.

In every application for a patent filed subsequent to December 31, 1897, responsive action must be made by the  
inventor within one year after the last office action or the case will become abandoned.



Claims 1 and 2 are objectionable on account of the presence therein of such expressions as "placing the cylinder so recorded and indented in an electrolytic solution". A mere manual operation such as this is not a step in a patentable process, and such expressions are surplusage in the claims.

The words "practically indestructable" in line 1, claim 3, are objected to as no record is practically indestructible.

The claims are, furthermore, rejected on reference to English patent to Young, No. 1478, Jan. 23, 1894, in Graphophone Tablets.

Claims 1 and 2, are drawn to a process, and claim 3, to an article. Applicant cannot retain both kinds of claims in this case, under Rule 41.

R.H.S.

W<sup>m</sup>. J. Rich,

Actg. Exr.

## IN THE UNITED STATES PATENT OFFICE.

Application of :  
T. E. Lambert, :  
Process for Producing Record : Filed August 14, 1889.  
Cylinders for Phonographs, :  
Serial No. 727,183. : Room 219.

Hon. Commissioner of Patents,  
Washington, D.C.

Sir:--

In the matter of the above named application, replying to Office letter of September 20, 1899, and in harmony with oral interview and demonstrations as to the operativeness of the process made on or about the 9th inst., we desire to say:

From the demonstrations made in the presence of the Examiner of Room 219 in the laboratory of the Patent Office by the inventor, we respectfully submit that the operativeness of the process for manufacturing the record and of the record itself were demonstrated to the satisfaction of the Office. We, therefore, respectfully request that the objection contained in the Office letter above ~~mentioned~~ noted be withdrawn.

With regard to the second paragraph of the Office letter, we submit that it has also been demonstrated satisfactorily to the Examiners in charge of this case that hydro-chlorous acid in water will have the effect set



forth in the specification and claims.

Claims 1 and 2 have been rejected on the English patent to Young. We submit that this English patent does not show an operative process for producing the record of applicant, or a satisfactory record - one that will meet the requirements of commerce - and that, being inoperative or a mere paper reference, it cannot stand in the way of applicant. In other words, it is the "last step that counts." The successful inventor, who after the repeated trials and failures of others has produced a useful article, should be given credit therefor and protection commensurate with his invention, and the failure of others should not stand as a stumbling-block in his way. In other words, the invention should be considered de novo and applicant given protection, as if such unsatisfactory attempt had never been made. We, therefore submit that this is not a fair reference, and that applicant's claims should be granted over such reference.

In order to remove the formal objections of the Office, we desire to re-state the claims as follows:

The present third claim we withdraw entirely in order to make it the subject of another application, which we understand to be now the rule and practice of the Office.

1. The process of producing record cylinders for phonographs, which consists in first forming a record or on a cylinder of wax with other relatively soft material, then subjecting the cylinder so recorded and indented to

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the action of an electrolytic solution to electrically deposit metal thereon and form a matrix, substantially as described.

2. The process of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, then subjecting the cylinder so recorded and indented to the action of an electrolytic solution to electrically deposit metal thereon and form a matrix, and then subjecting it to a cylinder of relatively soft material to pressure within the matrix so as to form an imprint or counterpart of the indentations on the matrix, substantially as described.

3. The process of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of relatively soft material - such as wax, then coating such cylinder with carbon or other electric-conducting material, then subjecting the cylinder so coated and recorded to the action of an electrolytic solution to electrically deposit metal thereon and form a matrix then shrinking the soft cylinder to remove the electrically deposited matrix and backing such matrix with a matrix mold, then subjecting a cylinder of relatively soft material - such as cellulose - to pressure within the matrix so as to expand it and form an imprint or counterpart of the indentations on the matrix, then allowing such cellulose cylinder or tube to harden within the matrix and be reduced



in diameter so that it may be withdrawn from such matrix,  
substantially as described.

Please change the title of the invention to

Processes for Producing record Cylinders for Phonographs

In the preamble of the specification, erase be-  
ginning with the words "In record cylinders" on line 5,  
down to and including the words "the same" on line 6, and  
in place thereof, insert

In processes for producing record cylinders for  
Phonographs

Same page, lines 15, 21 and 23, change "Indestruc-  
tible" to

infrangible

Page 2, line 13, erase "once formed be"

Line 23, same page, before "with" insert

at one end

Page 4, line 1, after "that it" insert

- the cellulose tube-

Same page, line 4, change "indestructible" to

infrangible

We respectfully sub it that all objections as to  
subject matter are now removed and the case in condition  
for an early allowance, which is respectfully requested.

Banning & Banning & Sheridan

Attorneys for Applicant.

Registration No. 1369.

Chicago, October 12, 1899.

2-246.

Room No. 219  
 All communications should be addressed to  
 The Commissioner of Patents,  
 Washington, D. C.

All communications respecting this  
 application should give the serial number,  
 date of filing, and title of invention.

J.H.D.

DEPARTMENT OF THE INTERIOR,

## UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., Nov. 4, 1899.

Mailed " " "

Thomas B. Lambert,

Care Banning &amp; Banning &amp; Sheridan,

Marquette Building,

Chicago, Ills.

Please find below a communication from the EXAMINER in charge of your application for

Record-Cylinder for Phonographs and Method of Producing the Same,  
 filed Aug. 14, 1899, Serial Number 727,183.

C. H. Duell  
 Commissioner of Patents.

Fig. 1 of the drawing is objectionable in that the carbon covering is shown on the inner side instead of outer side of wax cylinder, and this drawing should be corrected.

The applicant states that the Young patent of record, is not an operative process, but fails to show where it is inoperative or how it differed from his own. The question of the operativeness of this Young process arose some time ago, and in reply to a letter from the Chief Clerk of this Office, asking Mr. Young if his process was operative, Mr. Young replied as follows:

"I regret that I have not been able to reply to your letter of Sept. 15th before this; I desire to say at the time of taking

RULE 73. In every amendment the exact word or words to be stricken out or inserted in the application must be specified and the precise point indicated where the erasure or insertion is to be made. All such amendments must be on sheets of paper separate from the papers previously filed, and written on but one side of the paper.



out my patent, No. 1478 of 1894, there was no question in the Courts here in regard to the use of wax record, and I therefore manufactured a very large quantity of the patented article, and put them on the market, but later on, a suit was brought by the assignees of the wax patent, and the method of cutting a record on wax, and which is dated 1887, and rather than involve myself in expensive litigations, I have since the year 1894, refrained from making use of the patent.

My patent was allowed by the Controller of the Patent Office here after very strenuous opposition, on the part of other parties, and a practical demonstration of the process and the utility was made before the Controller.

Opposition was made by one Lioret, in particular, but my counsel was able to prove not only that Lioret obtained his idea from me, when he was in the employ of a Paris House, but that his system of reproduction was a failure, and the Controller was of opinion that Lioret while pretending to manufacture under his own patent, was really using mine.

If you require declaration to this effect, I shall be pleased to make them."

The claims are rejected on Young, of record.

G.R.B.

J. T. Newton, Exr.

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Hon. Commissioner of Patents,

Washington, D.C.

Sir:-

In the matter of the application of Thomas B. Lambert, serial No. 727,183, filed August 14, 1899, Record Cylinder for Phonographs and methods of Producing the Same, (Room 219), and in reply to office letter of September 20, 1899, therein:

In view of what is stated in said letter we think it advisable to amend the specification in some particulars as follows:

Page 1, line 15, before "practically" insert -  
of excessive longevity by the use of material

Strike out "indestructible" and insert -

infrangible

Same page, line 21, strike out "indestructible"

and insert

infrangible

Same page, line 23, strike out "indestructible"

and insert

infrangible

Page 2, line 13, strike out "once formed be"

Same page, line 23, after "it" insert

at one end

Same page, line 27, strike out "places" and

insert

brings



Page 3, line 1, after "copper" insert-

or other metal

Same page, line 5, strike out "B"

Same page, line 15, change "H" to

I

Same page line 17, change "I" to

I'

Same page, beginning with "I next" line 18,  
strike out down to and including "water", last line of  
the page, and insert -

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I next take a sort ring of cellulose or vulcanized rubber either in a raw or partially cured state, or previously softened with some solution and of sufficient thickness to receive in perfect form the in-

*B* dentations of the matrix and at the same time furnish a suitable backing or support for the phonographic reproduction of the record. This relatively thick ring or tube is then placed within the cylindrical opening of the matrix and by means of an expansive pressure with heat forced outwardly completely filling the matrix and against the inner surface thereof, thus making a counterpart of the same and a record similar to that on the original wax cylinder.

The ring thus formed, having on its outer face a faithful imprint of the matrix, is then allowed to harden either naturally or by artificially curing the substance thereof through which hardening it shrinks sufficiently to enable its subsequent removal to be made from the matrix without injury to either. As a shrinking or reducing medium I have used a solution of hydro chlorous acid and water in which the tube and matrix are placed as above

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Page 4, after line 1, strike out "it" and insert-

the tube

---

Page 4, after line 8, insert-

*B'* In carrying out my process it is an absolute requirement that the blank phonograms or tubes must be of a thickness to receive and retain in a perfect form the indentations of the matrix and

at the same time have within itself a sufficient backing or support for the reproduction of the record phonographically after the formation of the record on its face and the removal of the tube from the matrix. It is practically impossible to use very thin walled tubes or hollow cylinders for my process because the phonographic reproduction of sound from such thin records, supposing the tubes to be capable of even temporarily maintaining or holding their shape, would be weak, distorted, indistinct and imperfect, but as a matter of fact the records themselves made of thin material are not capable of retaining their shape and would be impractical in actual use. By using a relatively thick walled tube or hollow cylinder the objections which would occur in practice with a very thin tube are entirely overcome and the produced records are a merchantable article. It is to be understood that in applying pressure, to the interior of the xxxxxxxxx tube or cylinder for forcing the same outwardly and against the face of the matrix that such pressure must be simultaneously exerted over the entire surface of the tube or cylinder and in a uniform manner so as to simultaneously force the entire exterior surface against the interior face of the matrix, for if otherwise there would be great danger and liability of a flow of material and a consequent distortion therefrom producing an imperfect record.

Erase the claims and for the purpose  
of distinctly and clearly pointing out and defining the  
steps of the process or method sought to be claimed,  
make the following claims:

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 1. The method of producing record cylinders for phonographs which consists in first forming a record on a cylinder of wax or other relatively soft material rendering the surface of the wax cylinder electrically conductive and electrolytically depositing metal thereon forming a matrix, and then outwardly expanding under pressure a ~~thin~~ <sup>substantially thick</sup> cylinder, tube or softened material, within the matrix to obtain indentations of the record, substantially as described.

2. The method of producing record cylinders for phonographs which consists in first forming a record on a cylinder of relatively soft material such as wax, then coating such cylinder with carbon or other electric conducting material, and electrolytically depositing metal thereon forming a matrix, then shrinking the soft cylinder



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der to remove the electrically formed matrix and backing such matrix to form a matrix mold then outwardly expand <sup>sufficiently to pull its membrane shell from the matrix and</sup> ing under pressure a relatively thin cylinder or tube of softened material such as cellulose, within the matrix for the pressure to reproduce on the outer surface the counter part of the indentations in the matrix, then allowing such cellulose cylinder or tube to harden within the matrix and removing the record cylinder or tube from the matrix and then drying and hardening the record cylinder, substantially as described.

As thus amended, we respectfully submit that the case clearly avoids the Young patent of record. In the Young patent a very thin hollow cylinder is required which is collapsed inwardly in order to be removed from the matrix; while in applicant's invention the blank cylinder is and of necessity must be sufficiently thick to receive and retain its impressions without being collapsed and without danger of warping or distorting the record, also furnishing sufficient form or backing for the phonographic reproduction of the record.

The use of a very thin substance as required in the Young patent is impracticable for several reasons. It will not receive perfect indentations, especially if they are well pronounced; it will not retain its cylindrical shape unless properly backed which is mechanically impossible; and even if such a thin record can be made it is impossible to back and support it so as to avoid variations in its elasticity because of imperfect contact with the backing and these variations producing corresponding imperfections in the record will impair or destroy its usefulness. Applicant has repeatedly attempted to produce records in accordance with the Young patent, but has never been able to produce a record in any sense practical or operative.

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District of  
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November, 1899

For these reasons we respectfully submit that the claims as now presented clearly avoid the Young patent, and we respectfully ask an action accordingly.

Banning & Banning & Sheridan

Attorneys for Applicant.

Registration No. 1369.

City of Washington, )  
(ss.  
District of Columbia,)

THOMAS B. LAMBERT, whose application for Letters Patent for an Improvement in Recording-Cylinder for Phonographs and Method of Producing the same, Serial Number 727,163, was filed in the United States Patent Office, on or about the 14th day of August, 1899, being duly sworn deposes and says; that the subject-matter of the foregoing amendment was part of his invention, was invented before he filed his original application, above identified for said invention, was not known or used before his invention, was not in public use or on sale in this country for more than two years before the date of his application, and has not been abandoned.

Thomas B. Lambert,  
District of Columbia -ss:

Sworn to and subscribed before me this 22nd day of November, 1899.

W. Bertrand Acker

(Notarial)  
(Seal.)

Notary Public in & for D.C.



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Washington, D.C. November 22, 1899

Hon. Commissioner of Patents,

Washington, D. C.

Sir:

Referring to amendment of this date and the claims contained therein, we hereby amend application of THOMAS B. LAMBERT, No. 727,183, filed August 14, 1899, Phonographs, Room 219, as follows:

Erase "relatively thick" from line 7 of claim 1.

After "<sup>tube</sup>~~cylinder~~" in line 7 of claim 1, insert -

"sufficiently thick to maintain its shape after disengagement from the matrix, and"

Erase "relatively thick" from line 9 of claim 2.

After "tube" in line 9 of claim 2, insert -

"sufficiently thick to maintain its shape after disengagement from the matrix and"

As we understand it this puts the case in shape for issue, and we respectfully ask action accordingly.

Banning & Banning & Sheridan.

Attorneys for Applicant

Registration No. 1369.

E. J. O.  
11/22/99-

November 22, 1899.

Chicago, January 8, 1900.

Hon. Commissioner of Patents,

Washington, D.C.

Sir:-

We respectfully call attention to application of Thomas B. Lambert, serial No. 727,183, filed August 14, 1899, Record Cylinders for Phonographs, and Method of Producing the Same, (Room 219); and, as no interference has been declared, ask whether the case cannot be now passed to issue.

We are desirous of having this case passed to issue simultaneously with application No. 735,780, filed November 4, 1899; and we respectfully ask that proceedings be shaped accordingly.

Banning & Banning & Sheridan,

Attorneys for Applicant.

Registration No. 1369.

Sheridan.

Attorneys for Applicant



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Room No. 219  
 All communications should be addressed to  
 "The Commissioner of Patents,  
 Washington, D. C."

All communications respecting this  
 application should give the serial number,  
 date of filing, and title of invention.

J.H.D.

DEPARTMENT OF THE INTERIOR,  
 UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., January 18, 1900.

Mailed " " "

Thomas B. Lambert,  
 Care Banning & Banning & Sheridan,  
 Marquette Building, Chicago, Ills.

Please find below a communication from the EXAMINER in charge of your application, for  
 Record-Cylinder for Phonographs and Method of Producing the Same,  
 filed Aug. 14, 1899, Serial Number 727,183.

C. H. Druell  
 Commissioner of Patents.

Action upon this application has been delayed by reason of  
 other pending applications, the attorneys of which have been mak-  
 ing efforts to place those applications in condition for interfer-  
 ence with this application.

Upon careful reading of claim 1, it is found that that claim  
 is somewhat awkwardly worded, and the process is probably incom-  
 plete, and should also better distinguish from the patent to Lioret  
 No. 23,366 of 1893, Graphophones. The claim should be worded as  
 follows:

RULE 73. In every amendment the exact word or words to be stricken out or inserted in the application must be specified  
 and the precise point indicated where the erasure or insertion is to be made. All such amendments must be on sheets of paper  
 separate from the papers previously filed, and written on but one side of the paper. 24

In every application for a patent filed subsequent to December 31, 1897, responsive action must be made by the  
 inventor within one year after the last office action or the case will become abandoned.

The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive and electrolytically depositing metal thereon, forming a matrix, and then outwardly expanding under pressure within the matrix, a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix and finally removing the cylinder or tube by direct longitudinal movement.

This claim should be made within thirty days, or the interfering applications may be passed to issue.

J. T. Newton, Exr.<sup>27</sup>

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## IN THE UNITED STATES PATENT OFFICE.

Application of Thomas B. Lambert, :  
 :  
 Record Cylinder for Phonographs :  
 and Method of Producing the Same. : Room 219.  
 :  
 Serial No. 727,183, :  
 :  
 Filed August 14, 1899. :

Hon. Commissioner of Patents,

Washington, D.C.

Sir:-

In the matter of the above named application and replying to Office letter of the 18th inst. we desire to say:

In order to remove the formal objections of the Examiner and to bring the claim into accord with the kind suggestion of the Examiner, we desire to erase the first claim and re-state it as follows:

C. 1. The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive and electrolytically depositing metal thereon, forming a matrix and then outwardly expanding under pressure within the matrix, a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix and finally removing the cylinder or tube by direct longitudinal movement, substantially as described.

We respectfully submit that this removes all objections as to form and subject matter and places the case in condition for an early allowance which is earnestly requested.

Banning & Banning & Sheridan

Registration No. 1369.

Attorneys for Applicant.

January 22, 1900.

## IN THE UNITED STATES PATENT OFFICE.

Application of )  
 T.B. LAMBERT, ) Method for Producing Phonograph  
 serial No. 727,183, ) Cylinders,  
 Filed August 14, 1899. ) Room 219.

Hon. Commissioner of Patents,

Washington, D.C.

Sir:--

In the matter of the above named application, we desire to call the attention of the Office to the fact that the thirty days set in the Office letter of January 18, 1900 have expired. We, therefore, respectfully request that this case be not delayed any longer, but be sent forward to issue.

The case has now been held nearly ninety days awaiting the completion of the application by the parties of the other side, and we do not think it is just to the present applicant to delay it any further. We trust, therefore, that the interference will be declared, or the case passed to issue immediately.

Respectfully Submitted,

Thomas B. Lambert,

By Banning & Banning & Sheridan

His Attorneys.

Chicago, February 19, 1900.

Registration No. 1369.



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AMOUNT RECEIVED

\$ *20* *ck*  
CHIEF CLERK.

Div. 5

Chicago, Feb 26. 1900.

Hon Com of Patents

Washington, D.C.

Sir,

Inclosed please find check of our Mr T.A.Banning,  
No 3755 Fort Dearborn National Bank, this City for \$ 20. to pay  
the final Government fee on the application of Thomas B. Lambert,  
Serial No 727,183 Filed August 14, 1899. Improvements in Record-  
Cylinder for Phonographs and Method of Producing the same. If  
our Mr Sheridan has already paid this fee, please return check &  
oblige

very respectfully

Banning & Banning & Sheridan

Issue  
All communications  
"The Co  
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Thomas

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727,183.

*Issue Division.*

*All communications should be addressed to  
"The Commissioner of Patents,  
Washington, D. C."*

DEPARTMENT OF THE INTERIOR,

*United States Patent Office,*

Washington, D. C., March 3, 1900.

Thomas B. Lambert, assor.,  
c/o Banning & Banning & Sheridan,  
Marquette Building,  
Chicago, Ills.

SIR:

Your Application for a patent for an Improvement in  
Methods of Reproducing Phonograph Records.

filed August 14, 1899, 1899, has been examined and allowed.

The final fee, TWENTY DOLLARS, having been received, the Letters Patent will  
be forwarded in due order of business.

Additional copies of Specifications and Drawings will be charged for at the  
following rates: Single copies, uncertified, 10 cents each. The money should accom-  
pany the order.

Very respectfully,

C. H. Duell



Commissioner of Patents.

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Copies sent to  
patentee & assignees.

2-061.

INTERFERENCE.  
U. S. PATENT OFFICE  
MAY 9 1900  
DIV. 23.

DEPARTMENT OF THE INTERIOR,

*United States Patent Office,*  
J.H.D.

Washington, D. C., May 16, 1900., 189-  
Mailed " " "

Thomas B. Lambert,

Care Banning &amp; Banning &amp; Sheridan, Interference No. 20,534.

Marquette Building, Chicago, Ills.

Please find below a copy of a communication from the Examiner concerning your  
application for Record-Cylinder for Phonographs & Method of Producing  
the Same, filed Aug. 14, 1899, Ser. No. 727 183, patented March  
20, 1900, Patent No. 645,920.

Very respectfully,

Room No. 219.  
All communications should be addressed to  
The Commissioner of Patents,  
Washington, D. C.

*C. H. Duell*  
Commissioner of Patents.

Your case, above referred to, is adjudged to interfere with others, hereafter specified, and  
the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before the  
8th day of June 1900, with the subject of the invention,  
and name of party filing it, indorsed on the envelope. ~~The interference number should also be~~  
~~indorsed thereon.~~ The subject-matter involved in the interference is

The method of producing record cylinders for phonographs,  
which consists in first forming a record on a cylinder of wax or  
other relatively soft material, rendering the surface of the wax  
cylinder electrically conductive, and electrolytically depositing  
metal thereon forming a matrix, and then outwardly expanding under  
pressure within the matrix a cylinder or tube of softened material  
sufficiently thick to maintain its shape during and after the act  
of disengagement from the matrix, and finally removing the cylinder  
or tube by direct longitudinal movement.

The above issue is your claim 1 and is substantially claim 11  
of an application of Thomas A. Edison of Llewellyn Park, New Jersey  
whose attys. are Dyer, Edmonds & Dyer, No. 31 Nassau Street, New  
York, N.Y. J.T. Newton, Exr.

Strother

(Serial No.)  
727,183  
Patent No.

of  
County of  
State of  
Invention:

Petition  
Affidavit  
Specification  
Drawing  
Model  
Specimen  
First  
App. filed

Examined

Countersigned  
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Div. 23

(Serial Number,)

127,183

1899.

(Ex'r's Book,)

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Patent No. 645,920.

Thomas B. Lambert, Assor of  $\frac{3}{5}$  to Brian F. Philpot  
and Joseph Powell, of same place.

Of Chicago,

County of

State of Illinois.

Invention: Record-Cylinder for Phonographs and Method  
of Producing the Same.

Parts of application filed.	Petition	Aug. 14, 1899.
	Affidavit R	" " "
	Specification	" " "
	Drawing	" " "
	Model	_____
	Specimen	_____
	First fee Cash	\$ 15, Aug, 14, 1899.
" " Cert.		

App. filed complete Aug 14 - 99

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Examined Mch 1 /00. J. T. Newton Ex

Countersigned:

MAR 3 1900

J W Babson

For Commissioner.

Notice of allowance

March 3, 1900.

Final fee Cash

\$20 Feb. 28, 1900.

" " Cert.

, 189 .

Patented

March 20, 1899.

-----o-----1900

~~Banning & Banning & Sheridan,~~~~Marquette Bld'g,~~~~Chicago.~~

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1899.

## CONTENTS:

 $\frac{1}{2}$  Application / papers.

1. Rejection. Sept. 20/99
2. *Amend. A. Oct. 16/99.*
3. Nov. 4/99 Rejection
4. *Amend. B. Nov. 22/99.*
5. *Amend. " " "*
6. *Letter Jan. 10/00*
7. Jany 18, 1900 Letter
8. *Amend. C. Jan. 24/00*
9. *Letter Feb. 21/00*
10. X with ~~142~~<sub>282</sub> May 16 - 1900
- 11.
- 12.
13. 181. ACOUSTICS,
14. Graphophone, Tablets.
- 15.
- 16.
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## TITLE:

Improvement in Methods of Reproducing Phonograph Records.

172 DEFEN

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MENT.

Assignment.

Whereas I, Henri Jules Lioret, of 18 rue Thibaud, Paris, France, (post-office address), manufacturer, did obtain letters patent of the United States for an Improvement in Phonographs, which letters patent are numbered 528273, and bear date the 30th day of October, in the year 1894; and whereas I am now the sole owner of said patent and of all rights under the same; and whereas the Lambert Company, of Chicago, Illinois, United States of America, is desirous of acquiring the entire interest in the same:

Now, therefore, to all whom it may concern, be it known that, for and in consideration of the sum of four hundred dollars (\$400.) to me in hand paid, the receipt of which is hereby acknowledged, I the said Henri J. Lioret, have sold, assigned, and transferred, and by these presents do sell, assign, and transfer unto the said Lambert Company, the whole right, title, and interest in and to the said Improvement in Phonographs and in and to the letters patent thereof aforesaid; the same to be held and enjoyed by the said Lambert Company, for their own use and behoof, and for the use and behoof of their legal representatives, to the full end of the term for which said letters patent are or may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made.

In testimony whereof I have hereunto set my hand and  
247 Count 7.





affixed my seal at Paris, France, this 23rd day of February 1904.

(Signed) HENRI JULES LORET [SEAL]

Witnesses:

DOUGLAS HORACE BRANDON,  
MARION C. COXE.

CONSULATE GENERAL OF THE UNITED STATES OF  
AMERICA.

For the Republic of France at the City of Paris.

On the Twenty-third day of February A. D. 1904, before me, John K. Gowdy, Consul General of the United States of America at Paris, France, residing therein, duly commissioned and qualified, personally appeared Henri Jules Lioret to me known, and known to me to be the individual described in and who executed the within instrument, and he duly acknowledged to me that he executed the same freely and voluntarily for the uses and purposes therein mentioned.

In testimony whereof, I have hereunto set my hand and affixed the seal of the Consulate-General of the United States of America at Paris, aforesaid, the day and year above written.

JOHN K. GOWDY,  
[CONSULATE SEAL.] United States Consul General.



## Defendant's Exhibit Edison File-Wrapper A.

## UNITED STATES OF AMERICA.

DEPARTMENT OF THE INTERIOR,

PATENT OFFICE.

*To all persons to whom these presents shall come, Greeting:*

This is to certify that the annexed is a true copy from the Records of this office of the File-Wrapper and Contents, in the matter of the Application of Thomas A. Edison. Filed March 5, 1898 Serial Number 672650 for Improvement in Processes of Duplicating Phonograms.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this 16 day of June, in the year of our Lord one thousand nine hundred and of the Independence of the United States of America the one hundred and twenty-fourth.

C. H. DUELL,

[SEAL.]

Commissioner of Patents.

## PETITION.

TO THE COMMISSIONER OF PATENTS:

YOUR PETITIONER, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the County of Essex and State of New Jersey, prays that letters patent may be granted to him for the IMPROVEMENTS IN PROCESSES OF DUPLICATING PHONOGRAMS set forth in the annexed specification; and he hereby appoints RICHARD N. DYER, of No. 31 NASSAU STREET, NEW YORK CITY, his attorney (Registration No. 409), with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein,

to receive the  
Patent Office

TO ALL WHOM

Be it known  
the United States  
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to receive the patent, and to transact all business in the Patent Office connected therewith.

THOMAS A EDISON

SPECIFICATION.

TO ALL WHOM IT MAY CONCERN :

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the County of Essex and State of New Jersey, have invented certain new and useful IMPROVEMENTS IN PROCESSES OF DUPLICATING PHONOGRAMS, (Case No. 994) of which the following is a specification :

The object I have in view is to produce a practical process for the duplication of phonographic records, whereby a practically unlimited number of duplicate blanks of phonograms may be obtained which will be absolutely identical in every respect with the original record. Generally, I propose to construct a suitable matrix, preferably in metal, and by its use to impress duplicate phonograms with the phonographic record thereon, such phonograms being preferably constructed of a material having a greater coefficient of expansion than the material of the matrix or mold. By my process the phonogram, or the surface thereof, may be and preferably is constructed of a material too hard for the satisfactory indentation thereof of the phonographic record, whereby the duplicate phonograms may be made more durable than it is possible to make original records; but the duplicate phonograms may obviously be made of a softer material. For the construction of the matrix I prefer to employ the process of vacuous deposit described in my patent No. 526,147 dated September 18, 1894. The original phonogram is preferably constructed with a surface of wax or a similar material. This is placed in a suitable phonograph, and the phonographic record produced thereon in the usual way.



The phonogram so impressed with the phonographic record is placed in a high vacuum, in which an electric arc, continuous or discontinuous, is produced between the electrodes of metal, or in which metal vapor is otherwise produced. The electric arc produces a vapor of the metal of which the electrodes are composed, which vapor, or a metallic vapor otherwise produced within said chamber, is deposited on the indented surface of the phonogram, forming a layer of metal thereon, which follows accurately all the indentations of the record, however minute, owing to the highly comminuted condition of the metal deposit. The phonogram, while the deposit is taking place in the vacuum chamber, is revolved slowly by a suitable power connection, and this is especially necessary when the form of the phonogram is cylindrical, which it preferably is. The vacuous deposit is continued until the layer of metal is sufficiently thick, when the covered phonogram is removed from the vacuum chamber and is further covered by a more rapid process to give strength and body to the covering. A further covering of metal may be produced by electroplating a metal upon the vacuous deposit in the usual manner of electroplating, or the vacuous deposit may be backed up by casting upon it type metal, or other metal or alloy having a lower fusing point than the vacuous deposit, or this may be done after electroplating upon the vacuous deposit, or the vacuous deposit may be backed up by cement or gum or by plater-of-Paris; but a metal backing is preferred. The material of the original phonogram is then dissolved or melted off of the metal covering, leaving, in the case of cylindrical phonograms, a hollow metal cylinder, or one internally faced with metal, carrying the phonographic record in relief upon its inner surface. While a process of vacuous deposit such as I have described in said patent is preferable for the production of the matrix or mold, as in that way a matrix

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or mold following absolutely the original record, however minute, will be obtained, it will yet be understood that the matrix or mold may be produced in other ways, for instance by the process of electroplating. A specially prepared plumbago of exceedingly great fineness might be employed to cover the waxlike surface as a basis for the electroplating, or gold-leaf or silver-salts reduced by chemical re-agents to the metallic state might be used for the same purpose. The electro-deposition, however, upon the original phonogram will not, in the case of very fine records, result in absolutely correct reproduction, as is the case with the process of vacuous deposit, so that the latter, as stated, is considered the preferable mode of operation. The phonograms which are to be duplicated by means of the matrix or mold obtained by any of the processes indicated, and preferably by a process of vacuous deposit as stated, are preferably composed of a material having a higher coefficient of expansion than that of the matrix or mold. <sup>A</sup> The phonogram blank to be dupli-

Insert D'

cated is, under normal temperatures, of a diameter very slightly less than the bore of the matrix or mold, whereby the blank may be inserted in the same. When the blank is thus placed within the matrix or mold, both the matrix and the blank contained therein are, or the blank alone is, brought to a higher temperature, whereby the blank will expand and will be brought into intimate contact with the interior surface of the matrix or mold, whereby the record contained therein will be impressed with absolute accuracy upon the surface of the blank. The expansion of the blank into this intimate engagement with the interior of the matrix or mold may be effected in any suitable way, such as by maintaining the matrix or mold with the blank contained therein in a heated atmosphere. By making the blank of a material having a higher coefficient of expansion than the matrix or mold, the blank will be properly



expanded to receive the impression of the record, notwithstanding the fact that both the blank and mold may be subjected to the same temperature. In order to facilitate the operation, I prefer to insert a tapering mandrel within the blank after the blank has been placed in the matrix or mold, and to force the mandrel tightly within the blank after the latter has been expanded into engagement with the record, whereby the blank will be further expanded mechanically into absolute intimacy with the record, after which the mandrel will be immediately withdrawn. With blanks made of sufficiently elastic material, the entire expansion might be effected mechanically by forcing a tapering mandrel within the same. After the blank has been expanded so as to receive the impression of the matrix or mold, it is removed by first shrinking it in any suitable way, as by a refrigerating chamber, and by then

by direct longitudinal movement

4/19/00 withdrawing the blank. I find that by the process above described, and particularly when a matrix or mold is obtained by a process of vacuous deposition, phonogram blanks can be obtained which will be accurate reproductions of the original blanks, and wherein the quality and intensity of the original vibrations will be reproduced with absolute faithfulness. I find, moreover, that since by this process there is little or no wear upon the matrix or mold, a practically unlimited number of reproductions may be obtained from a single matrix or mold. The degree of heat necessary to properly expand the blank will depend largely upon the material of which the blank is formed, and upon the closeness of fit of the blank when inserted within the matrix or mold. For the same reasons, the extent of the reduction in temperature in chilling and shrinking the blank will vary to a considerable extent.

The invention is illustrated for convenience in connection with a cylindrical phonogram. In the accompany-

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ing drawings forming a part hereof, is shown a section through the matrix or mold, blank and mandrel.

A represents the record surface of the matrix or mold, which is obtained preferably by depositing a metal *in vacuo* upon an original blank containing a record produced in the ordinary way. B is a backing, preferably of zinc, applied to the record surface in any suitable way, such as by electro-deposition. C represents the blank to be duplicated, which is preferably provided with a tapered bore, as is now common. <sup>A</sup><sub>D</sub> This blank will be turned down, so that it may be inserted within the matrix or mold with a close fit. The blank to be duplicated may be, and preferably is, of a harder material than can be practically or satisfactorily engraved or indented by a phonograph, whereby the duplicate phonograms will be more durable than could be obtained in the first instance by the operation of a recording or indenting device actuated directly by the sound waves. These blanks may, therefore, be made of a relatively hard material, such as asphalt; or of stearic acid or stearate of soda, mixed with various proportions of fine precipitates, such as chalk, slacked lime or lampblack; or waxes or resins may be used, such as sealing-wax or shellac, mixed with fine precipitates like chalk; or polished ebonite, vulcanized hard rubber or celluloid may be used; or glue may be employed, either alone or mixed with precipitates, such as chalk. D represents a tapered mandrel, which may be inserted within the blank C. E represents a support for the matrix or mold and for the blank within the same, said support having an opening F therein, whereby the mandrel D may be moved laterally within the blank.

In carrying out my process with an apparatus of this kind, I prefer to proceed as follows:—The matrix or mold having been obtained in the desired way, will be placed upon the support E, and the blank to be duplicated



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will be inserted within said matrix or mold, after which the mandrel D will be introduced within said blank. These parts will then be subjected to heat, such as by being maintained in a heated atmosphere, whereby the blank will, by reason of its greater coefficient of expansion than the matrix or mold, be expanded into intimate contact with the record, and the record will be accurately impressed thereon. When the blank has been thus expanded into engagement with the matrix or mold, the mandrel D will be forced tightly within the blank, so as to further expand it mechanically, whereby the blank will be forced into absolute intimacy with the record and an impression will be received thereon which will be clear, sharp and an absolutely faithful reproduction of the original record. After the mandrel has been forced within the blank, it is immediately withdrawn, and the blank is then chilled in any suitable way, such as by placing the matrix with the blank contained therein in a refrigerating chamber. In this way the blank will shrink sufficiently to be removed from the matrix or mold.

Having now described my invention, what I claim is:—

- 5-5-98 1. The process of duplicating <sup>cylindrical</sup> A phonograms having a phonographic record thereon, which consists in forming a matrix or mold wherein the original record will be reproduced in relief, in loosely engaging the <sup>continuous cylindrical</sup> A blank phonogram with said matrix or mold, and in finally intimately engaging the blank phonogram with the said matrix or mold whereby the entire record will be impressed upon said blank phonogram simultaneously, substantially as set forth.
- Sept. 2-98 1 ¶. The process of duplicating phonograms having a phonographic record thereon, which consists in forming

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a matrix or mold wherein the original record will be reproduced in relief, in loosely engaging a blank phonogram with said matrix, and in finally intimately engaging the blank phonogram with said matrix or mold by changes in temperature, substantially as set forth.

2 §. The process of duplicating phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, and in intimately engaging a blank phonogram with the said matrix or mold by a change in temperature, substantially as set forth.

3 §. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced

5-5-98 in relief, in inserting the <sup>continuous cylindrical</sup> blank to be reproduced within  
3-21-00 said matrix or mold, ~~and~~ in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, <sup>o</sup> substantially as set forth.

Insert O.

~~5. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram so as to form a cylindrical matrix or mold, in inserting the <sup>continuous cylindrical</sup> blank to be reproduced within said matrix or mold, and finally in intimately engaging the blank with the record in relief carried by the bore of said matrix or mold, whereby the record will be simultaneously reproduced on said blank, substantially as set forth.~~

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6. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram so as to



“ ~~form a cylindrical matrix or mold, in inserting the <sup>continuous cylindrical</sup> blank to be reproduced within said matrix or mold, and in finally expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, substantially as set forth.~~

4 ~~7~~. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram so as to form a matrix or mold, in inserting the blank to be reproduced within said matrix or mold, in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, ~~and~~

3-21-00 in finally shrinking the blank to <sup>disengage</sup> ~~remove~~ it from the matrix or mold, ~~and~~ substantially as set forth.

Insert C'

5 ~~8~~. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, and in finally ~~mechanically expanding said blank into intimate contact~~ <sup>subjecting the expanded blank to pressure to more intimately engage it</sup> with said record, substantially as set forth.

9-2-98

6 ~~9~~. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or

E.  
“ subjecting the expanded blank to pressure to more intimately engage it with said record, substantially as set forth.  
“ engagement with the record in relief carried by the bore of said matrix or mold, and in finally expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, substantially as set forth.

5-5-98

7 ~~10~~. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram so as to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, and in finally expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, substantially as set forth.

3-21-00 reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, and in finally expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, substantially as set forth.

Insert C2

Insert A  
and 11-98

8 ~~11~~. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, and in finally expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, substantially as set forth.

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9 ~~12~~. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, and in finally expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, substantially as set forth.

“ continuous cylindrical blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, and in finally expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, substantially as set forth.

1-11-00 or mold, and in finally expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, substantially as set forth.

Insert C3

Insert D

11-98



“ subjecting the expanded blank to pressure to more intimately engage it  
mold, in ~~mechanically expanding the blank into intimate~~  
“ ~~engagement~~ with such record, and in finally chilling the  
blank to remove it from the matrix or mold, substantially  
as set forth.

5-5-98 7 + 0. The process of duplicating <sup>cylindrical</sup> A phonograms hav-  
ing a phonographic record thereon, which consists in  
depositing a metal upon the original phonogram to form  
a matrix or mold, in covering said matrix or mold with  
“ a metal backing, in introducing the <sup>continuous cylindrical</sup> A phonogram to be  
3-21-00 reproduced within said matrix or mold, ~~and~~ in expanding  
said phonogram into intimate engagement with the record  
in relief carried by the bore of said matrix or mold, A sub-  
Insert C<sub>2</sub> stantially as set forth.

Insert A  
May 27-98 >

3-9 + 1. The process of duplicating cylindrical phono-  
grams having a phonographic record thereon, which con-  
sists in depositing a metal upon the original phonogram  
so as to form a matrix or mold, in inserting within said  
matrix or mold a blank to be reproduced made of a ma-  
terial having a higher coefficient of expansion than said  
matrix or mold, and in heating the blank and matrix  
carried thereby, whereby the blank will be expanded into  
intimate engagement with the record in relief carried by  
the bore of said matrix or mold, substantially as set forth.

5-5-98 4-10 + 2. The process of duplicating <sup>cylindrical</sup> A phono-  
grams having a phonographic record thereon, which con-  
sists in depositing in a vacuum a metal vapor upon the  
original phonogram so as to form a matrix or mold, in in-  
“ <sup>continuous cylindrical</sup>serting the A blank to be reproduced within said matrix  
3-21-00 or mold, ~~and~~ in expanding the blank into intimate engage-  
ment with the record in relief carried by the bore of said  
matrix or mold A substantially as set forth.

Insert C<sub>3</sub>  
Insert D  
Cl. 11 >



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184 *Exhibit Edison File-Wrapper A.*

This specification signed and witnessed this 21st day of February 1898

THOMAS A EDISON

Witnesses:

J. F. RANDOLPH

RICHD N. DYER.

OATH.

*State of New Jersey, County of Essex, ss.*

Thomas A. Edison, the above named petitioner, being duly sworn, deposes and says that he is a citizen of the United States, and a resident of Llewellyn Park, in the County of Essex and State of New Jersey; that he verily believes himself to be the original, first and sole inventor of the IMPROVEMENTS IN PROCESSES OF DUPLICATING PHONOGRAMS described and claimed in the annexed specification; that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof; or patented or described in any printed publication in the United States of America or any foreign country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United States for more than two years prior to this application, and that no application for foreign patent has been filed by him or his legal representatives or assigns in any foreign country.

THOMAS A. EDISON

Sworn to and subscribed before me this 21st day of February 1898.

J. F. RANDOLPH

Notary Public.

State of New Jersey

[NOTARIAL SEAL.]

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Dear Sir:

as follows:

Claim 1,  
Same claim  
cylindrical.

Claim 4,  
cylindrical.

UNITED STATES PATENT OFFICE,  
WASHINGTON, D. C., May 3, 1898.

Claims 1, 4, 5, 6, 10 and 12 are each rejected on the patent to Edison, #484,582, October 18, 1892, Acoustics, Graphophones. The matrix described in this patent is the same as that described in this application and is obtained in the same way.

In lines 82 to 92, a method of obtaining duplicate phonograms is described which consists in introducing sheets of smooth material, like waxed paper or tin foil into the matrix in which case they would of course be in loose engagement with said matrix and in finally pressing the paper or tin foil upon the surface of the matrix by means of a plunger or otherwise.

As at present advised, the remaining claims may be allowed. In view of a probable interference, applicant is required to amend this application within thirty days from the date of this letter or on or before June 2, 1898. If the application should not be amended by this time, the interference will either be declared under Rule 96 or the interfering application passed to issue as the circumstances of the case may warrant.

J. T. NEWTON

S. F.

Ex.

HON. COMMISSIONER OF PATENTS,

*Dear Sir:* In the above entitled application, I amend as follows:

Claim 1, line one, after "duplicate" insert—cylindrical. Same claim, line four, before "blank" insert—continuous cylindrical.

Claim 4, line five, before "blank" insert—continuous cylindrical.



Claim 5, line four, before "blank" insert—continuous cylindrical.

Claim 6, line four, before "blank" insert—continuous cylindrical.

Claim 10, line one, after "duplicate" insert—cylindrical. Same claim, line five, before "phonograph," insert—continuous cylindrical.

Claim 12, line one, before "phonographs," insert—cylindrical. Same claim, line four, before "blank" insert—continuous cylindrical.

It is believed that the case as now presented is in condition for allowance.

The rejected claims have now been amended to include applicant's process in its ultimate form, *i. e.*, as applied to the duplication of cylindrical phonogram blanks. In carrying out such a process, the blank to be duplicated after it has been inserted in the matrix, is intimately engaged, as by expansion, with the record on the bore of the matrix.

In applicant's prior patent, to which the examiner refers, the preferred method consists in first forming a matrix and then splitting the same into three parts, and in molding or casting the duplicate blanks within the matrix.

It is suggested in the patent as another way of carrying out the method to take sheets of smooth material, such as wax paper or tin foil, and in then "pressing them upon the surface of the mold by a plunger or otherwise, the sheets being afterward backed up by a wax, resin, or cement."

With such a process the examiner will see that it will be manifestly impossible to expand the sheets, and if that process were carried out the sheets after having been placed within the matrix would have to be unrolled to a slight extent in order to allow them to engage with the

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record. This would manifestly result in very imperfect reproduction at the joint, and the process would be entirely distinguishable from one wherein continuous cylindrical blanks were employed.

The examiner's attention is particularly directed to the fact that Claims 4, 6, 10 and 12 are all limited to *expanding* the blank into contact with the record. In the case of a sheet of smooth material, which would not be a continuous cylinder, it would be manifestly impossible to *expand* such a sheet into contact with the record. If, however, the claims are not acceptable to the examiner, it is requested that the interference referred to may be declared, leaving the question of the patentability of the rejected claims until after the determination of that interference.

Very respectfully,

RICHD. N. DYER,  
Attorney for Edison.

New York City  
May 4, 1898.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., May 19, 1898.

This application has been reconsidered in view of applicant's amendment and argument filed on the 5th instant.

Claims 1, 4, 5, 6, 10, and 12 are each again rejected on the patent to Edison of record.

Applicant's attention is directed to the statement in lines 90 to 92 of this patent that the method, which has been previously described, may be used for phonograms with cylindrical surfaces.

Applicant's argument with reference to claims 4, 6, 10 and 12 in regard to the term "expanding the blank" into contact with the record has been noted. As was previously stated however, when the wax paper or tinfoil is



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placed within the cylindrical mold, it lies in loose engagement therewith and is afterward pressed into close engagement by means of a plunger or otherwise. This operation would necessarily result in increasing the diameter of the cylindrical sheet of paper or tinfoil, or in other words, it would expand the same into contact with the record.

In view of the interference previously referred to, applicant is again given thirty days to amend this application. These claims if allowed will probably be included in interference, hence their patentability must be settled before the interference is declared.

J. T. NEWTON

S. E. F.

Ex.

HON. COMMISSIONER OF PATENTS,

*Sir:* In view of the probable interference in which this case may be involved, it is requested that the Examiner suggest a suitable claim or claims to be substituted in lieu of claims 1, 4, 5, 6, 10 and 12. This request is made in view of the recent decision in *Hammond vs. Hart*, 83 O. G. 743.

Very respectfully,

THOMAS A. EDISON.

By RICHARD N. DYER

May 23, 1898.

Attorney

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., May 24, 1898.

Inasmuch as this application has not been amended since the last official action, said action is repeated. In accordance with applicant's request however, the following claims are suggested:

The method of producing phonograms, which consists

in securing reverse expanding and contraction drawal mold.

The method consists in securing there heating plunger and with

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S. E. F.

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*Sir:—C*

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consists in maintaining the mold, expanding the plastic, withdrawal the mold. s

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reverse record shell and tapering a taper and cooling initially as set

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in securing a hollow metallic mold or shell containing the reverse record, placing a plastic blank in said mold, expanding both by heat, impressing the record in the plastic, and contracting the "phonogram," so made by the withdrawal of heat, and removing the phonogram from the mold.

The method of making hollow phonograms, which consists in securing a hollow metallic shell with reverse record therein, inserting a plastic blank in said shell and then heating both, expanding the blank by forcing a tapering plunger therein, withdrawing the plunger, and cooling and withdrawing the phonogram.

If these claims are inserted and the rejected claims canceled, the interference need not be further delayed.

J. T. NEWTON

S. E. F.

Ex.

HONORABLE COMMISSIONER OF PATENTS,

Sir:—Complying with the suggestion of the Examiner,

I insert the following claims:

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~~11. The method of producing phonograms which consists in securing a hollow metallic mold or shell containing the reverse record, placing a plastic blank in said mold, expanding both by heat, impressing the record in the plastic, contracting the "phonogram" so made by the withdrawal of heat, and removing the phonogram from the mold, substantially as set forth.~~

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Substitute  
B  
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~~12. The method of making hollow phonograms which consists in securing a hollow metallic shell with the reverse record therein, inserting an <sup>expansible</sup> A plastic blank in said shell and then heating both, expanding the blank by forcing a tapering plunger therein, withdrawing the plunger, and cooling and withdrawing the phonogram, substantially as set forth.—~~

Change the numerals of claims 11 and 12, to 13 and 14.



It is noted that the two claims which the Examiner suggests and which have been above incorporated, are restricted to the heating of both the blank and the mold, and in that respect are not so broad as claims which have already been allowed and which will cover either the heating of the blank or the shrinking of the mold. It is hoped that the interference referred to may be declared under Rule 96, and after the interference has been disposed of, the question of the rejected claims can be considered.

Very respectfully,

RICH'D. N. DYER F Attorney for Edison  
New York, May 26, 1898.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., June 4, 1898.

Your case above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before the 29th day of June, 1898, with the subject of the invention, and the name of the party filing it, indorsed on the envelope. The interference number should also be endorsed thereon. The subject-matter involved in the interference is

Count 1

The process of duplicating phonograms having a phonographic record thereon, which consists in forming a matrix or mold wherein the original record will be reproduced, in loosely engaging a blank phonogram with said fold or matrix, and in finally intimately engaging the blank phonogram with said matrix or mold by changes of temperature.

This is substantially claim 10 of an application of Maurice Joyce of Washington, D. C., and includes the patent-

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able subject-matter of claims 2 and 3 of your application.

Count 2

The method of duplicating phonograms, which consist in securing a hollow cylindrical mold with reverse phonogram on its inner surface, introducing a plastic material into said mold and reproducing the phonogram on the external surface of said material, changing the relative size of the model and the plastic material, and withdrawing the phonogram so made from the end of the cylindrical mold.

This is substantially claim 11 of another application of Joyce and includes the patentable subject-matter of claim 10 of the same application, claims 1, 2, 3 and 4 of his other application and claims 7, 8, 9, 11, 12 and 13 of your application.

Joyce's attorney is W. A. Bartlett of Washington, D. C.

This interference is declared under Rule 96 as to your application, the question of patentability of the rejected claims being deferred until after the determination of this interference.

J. T. NEWTON

S. E. F.

Ex.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., June 30, 1898.

The interference number 19,545, entitled Edison *vs.* Joyce, in which this application was involved, has been suspended for the purpose of citing the following newly discovered references

English patent to Lioret, #23366 of 1893 in Graphophones, and

English patent #1,478 of 1894 in Graphophones, Tablets.



All of the claims in this application are rejected on these references.

In view of the interferences, applicant is given 30 days with which to amend this application.

If it is not amended within this time, the interference will either be declared or the interfering application passed to issue as the circumstances will seem to warrant.  
S. E. F. J. T. NEWTON, Ex.

HONORABLE COMMISSIONER OF PATENTS,

*Sir:* It is noted that the Examiner rejects all the claims in the above entitled application on British patents Nos. 23,366 of 1893 and 1478 of 1894.

The former of these British patents, applicant finds is the same as the U. S. patent to Lioret No. 528,273 dated October 30, 1894. The process which that patent describes is essentially different from applicant's invention. In the Lioret patent an original blank is first made on a soft steel cylinder having a fine spiral thread on its periphery, the record being cut upon or into the edge of said thread by a chisel-like recording device. Manifestly with such an original record very imperfect results could only be secured, and it is doubted if the *quality* of tones would be reproduced thereby. However, since Lioret describes his phonograph as being particularly adapted for phonograph dolls, and since the records used in such toys are generally very loud and are principally musical selections, such an original record might answer for this specific purpose. Having obtained an original record in the way described, the cylinder is tempered, after which a galvano-plastic mold is obtained therefrom. Assuming that it would be possible to make a very crude and rough original record or a matrix on a steel screw-threaded cylinder as Lioret

describes, vanoplastic the necessity is the case wax blank thus far on by reason which he of ord cut on kind of mo would be a ord in bas-record ther cured is no outwards fr patentee pro ord which is This is don tic material having a p surface, it in the mold of the threa the fit betwe has thus bee hot water so plastic. Wh tic, a plunge mass is force enters the s be impresse and the mo water so as be unscrewed with the Li

describes, then of course a very close and accurate galvanoplastic mold could be obtained therefrom without the necessity of an intermediate conducting material, as is the case when the mold is to be made from an original wax blank as applicant described. If Lioret's process thus far outlined is at all operative, it is only operative by reason of the particular kind of an original matrix which he obtains, namely, one made of metal with the record cut on the top of a fine screw thread, and the only kind of mold which could be obtained from such matrix would be also a specific type, namely, one having the record in bas-relief in the bottom of a spiral groove. The record therefore from which reproductions are to be secured is necessarily located a relatively great distance outwards from the bore of the mold. How then does the patentee propose to secure his reproductions from a record which is thus, at first glance, practically inaccessible? This is done by making the reproductions of a very *plastic* material such as celluloid, a ring or sleeve of which having a *plain* surface is inserted within the mold, such surface, it being noted, being separated from the record in the mold by a distance at least as great as the thickness of the threads and depending also upon the closeness of the fit between the blank and the mold. When the blank has thus been inserted in place, the whole is inserted in hot water so as to *soften* the celluloid blank and make it *plastic*. When it has thus been rendered sufficiently plastic, a plunger is inserted into the blank, and the plastic mass is forced or displaced outwards, so that the material enters the spaces between the threads and the record will be impressed thereon. The plunger is then withdrawn, and the mold with its contained blank inserted in cold water so as to contract the blank slightly and allow it to be unscrewed from the mold. As has been pointed out, with the Lioret process, depending absolutely upon the



making of an original matrix with the record cut on top of a fine screw-thread formed on a steel cylinder, it would be impossible to make anything but the very roughest kind of musical records. Applicant, furthermore, believes that if a mold were made as Lioret describes, a plastic blank inserted therein, and the whole immersed in water, the space between the threaded mold and the blank would be immediately filled with water, and the water would not be expressed by the displacement of the blank, but would remain in the mold, so that the record would be utterly worthless, even in the limited field which Lioret describes. Whether this is so or not, it is entirely clear that Lioret does not rely upon changes of temperature to bring about an *engagement* between a blank and a mold containing a record to be reproduced and by which reproductions can be obtained. The heating of the blank as described by Lioret is effected solely for the purpose of making it soft in order that the mass may be *displaced*, so to speak, and be forced into the record contained at the bottom of the grooves in the mold. With applicant's process, the blank is heated for the sole purpose of causing it to expand and engage tightly with the record formed on the mold. Since perfect cylindrical molds and blanks are used, the latter may be fitted within the mold within .002 of an inch, so that the proper expansion of the blank may be secured without appreciably affecting the hardness and brittleness thereof. This is important because if an attempt were made to effect reproductions from a mold such as Lioret describes, the blank would have to be made so plastic that when pressure was applied to it, the material thereof would exude at the ends of the mold.

British patent No. 1478 on its face refers to the Lioret process. It differs, however, from that process in two respects. In the first place, the original record is made on

a wax cylinder first coating the material, then electroplate. Secondly, the mold is withdrawn. The British patent is described thereby. The heating of the blank of making it plastic. The patent is not identical with the former British patent. The intention was to carry out the same way. The original record prior to only in the making and applicant does not result in the making. The finest of plastic are invariably lost resulting from the therefore give no. With the other to imperfect. With fore, the Examination be made, because omitted, while other literated.

It being the fact ences to which the is the heating of the panding the blank done solely for the to enable it to be

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a wax cylinder, and the mold is obtained therefrom by first coating the cylinder with plumbago or other suitable material, then electroplating, and finally backing up the electroplate. Secondly, the blank to be reproduced is made purposely very thin, and after being expanded into the mold is withdrawn by collapsing the blank. The second British patent makes it very clear that in the process described thereby, as well as in that invented by Lioret, the heating of the blank is performed solely for the purpose of making it plastic. The process of the second British patent is not illustrated, but since it refers specifically to the former British patent to Lioret, apparently the invention was to carry out the process in all other respects in the same way. The use of plumbago for coating an original record prior to electroplating the same, is possible only in the making of the roughest kind of duplicates, and applicant does not consider that such a process would result in the making of commercially acceptable blanks. The finest of plumbago particles obtainable on the market are invariably larger than the indentations of the record resulting from the aspirates or overtones, and such tones therefore give nothing but a rushing or scratching sound. With the other tones, reproductions would be necessarily imperfect. With the process of the second patent therefore, the Examiner will see that reproductions could not be made, because some of the tones would be absolutely omitted, while others would be largely, if not entirely, obliterated.

It being the fact therefore, that in neither of the references to which the Examiner directs applicant's attention is the heating of the blank effected for the purpose of expanding the blank into contact with the record, but is done solely for the purpose of making the blank plastic to enable it to be displaced and forced into contact with



the record, it is clear to applicant that neither of the references is an anticipation of his invention. Reconsideration is therefore requested.

Very respectfully,

RICHD N. DYER  
Attorney for Edison.

New York, July 6, 1898.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C. , July 27, 1898.

This application has been carefully re-considered in view of the applicant's argument of the 7th instant.

The differences between the forms of original blanks used by applicant and the patentees of record, are recognized.

The essential part of the process in all the cases, however, appears to be precisely the same. Both the applicant and patentees obtain the hollow cylindrical shell by electro-deposition, insert a blank into the same, heat it and afterward expand the blank into intimate engagement with the record.

Applicant's contention that in the English patent to Lioret, the blank is not heated for the purpose of pressing it into engagement with the record, is noted. It must be conceded, however, that since the blank is afterward cooled for the purpose of contracting it, that the application of heat to the blank will cause it to expand. The question then as to whether the expansion of the blank will be sufficient to cause the same to engage intimately with the record, depends on the depth of the screw threads which are cut in the original blank and upon the coefficient of expansion of the material used for obtaining the duplicate. The selection of the proper depth of the

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groove on the original blank and of the material for making the duplicate, are mere matters of choice and are not sufficient to confer patentability over the reference cited.

Applicant's process is also set forth in the English patent #1478 of 1894, of record, with the exception that the blank is collapsed in order to take it from the mold. The mold which is used in this case, appears to be precisely the same as that employed by applicant. It is held that there would be no invention in using the celluloid blanks shown in the English patent to Lioret, in connection with this mold.

Each of the claims in this case is therefore rejected upon the reasons and references of record, taken in connection with the fuller reasons given above.

In view of the interference previously referred to, applicant is again given 20 days within which time to amend this application.

WM. J. RICH,  
Acting Examiner.

S. E. F.

HON. COMMISSIONER OF PATENTS,

*Sir:* The Examiner in charge of the above-entitled application, on July 27, 1898, in again rejecting the claims, requested amendment of the application within twenty days from that date. Upon receipt of that letter, the Examiner was interviewed personally and the application was discussed with him. Applicant expects in the course of a few days to submit to the Examiner arguments, affidavits and exhibits in support of the application, and as a result of which it is believed the Examiner will allow the claims. It is, therefore, requested that the application be held in abeyance for a period of two weeks from



this date, in which to submit additional arguments and reasons in support thereof.

Very respectfully,

RICH N. DYER

New York, August 24, 1898.

F

AFFIDAVIT OF CHARLES N. WURTH.

*State of New Jersey, County of Essex, ss.*

Charles N. Wirth, a citizen of the United States, having been first duly sworn, on oath doth depose and say as follows:

My name is Charles N. Wirth, I reside at Orange, New Jersey, and am employed by Thomas A. Edison in his laboratory at Orange, New Jersey. My employment with Mr. Edison commenced prior to the year 1893. Since a period prior to that year, I have been constantly at work under Mr. Edison's supervision and direction on phonographic work, and my time has largely, and during extended periods has continuously, been taken up in carrying out Mr. Edison's instructions and in making experiments under his direction relating to processes for duplicating phonographic records. The experiments which I conducted prior to the year 1893 were varied and numerous.

Prior to the year mentioned, Mr. Edison determined that the successful process for the reproduction of phonographic records was the one which he describes in the above-entitled application for Letters Patent. That process consists in first taking a phonogram blank having a record thereon, in plating an infinitesimally thin coating of metal on the blank by the electro-vacuum process described by Mr. Edison in his patent No. 526,147, dated September 18, 1894, in then electroplating a heavier layer

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of metal on the vacuous coating referred to, and in then backing up the electro deposit by a suitable metal to form a matrix or mold of the desired thickness with the record carried on its bore in relief. The blank phonogram on which the record is to be impressed is then inserted in the mold, being fitted therein as closely as possible and preferably within .002 of an inch. The mold having the blank therein is then subjected to a rise in temperature so as to expand the blank, without, however, making it plastic or destroying its friability, whereby the blank will engage with the record on the bore of the mold by reason of the difference in the coefficient of expansion of the blank and the mold. A tapered plunger is then forced into the blank so as to more intimately engage it with the record in relief and make a better and sharper duplicate. The mold and blank are then cooled, so as to shrink the blank more rapidly than the mold and separate the two, whereby the blank may then be removed. This is the process Mr. Edison describes in his application, which he explained to me prior to the year 1893, and which I carried out under his direction prior to that time.

I present herewith a matrix or mold, No. 54, which was made by me under Mr. Edison's direction prior to the year 1893, said matrix or mold containing in relief a band selection called "The Anvil Polka." I have marked this matrix or mold "Wurth's Exhibit Edison Mold No. 54," and have affixed my name to the tag secured thereto. I also present herewith a duplicate record made from this mold prior to the year 1893, which I have marked "Duplicate Record made from Mold No. 54," and have correspondingly identified it.

After the process was invented by Mr. Edison and had been successfully carried out by me under his direction prior to the year 1893, practically my entire time was occupied, up to the date of the filing of the above-entitled



application, in carrying on experiments relating to the perfection of the sound records, and especially to the production of loud-talking diaphragms by means of which original records could be secured from which better, clearer and louder-talking duplicates could be secured. I am able at the present time to obtain as a result of these experiments records which are somewhat better in quality than the duplicates which I secured prior to the year 1893, but with this exception the duplicates obtained by me prior to that year are as accurate as I can now obtain. The process of making the records has not been changed in any essential particular since the making of the accompanying mold No. 54 up to the present time, and it corresponds in every respect to the process described by Mr. Edison in the application above referred to.

I have been requested to examine the United States patent to H. J. Lioret No. 528,273, dated October 30, 1894, and the British patent to J. L. Young No. 1478 of 1894. Having devoted my time almost continuously for a number of years to this special class of work, I am able to form and express a positive opinion concerning the practical utility of the duplication processes described in these two patents.

In the Lioret process as described by the inventor, an original record is first taken on a soft steel cylinder, the record being cut on the top of a screw-thread formed on the periphery of the cylinder. It is possible to do this, as I have made such records myself. The original record thus obtained by Lioret is then electroplated, the electroplating being sufficient to form a mold of the desired body, no backing, so-called, being described by him. This is, of course, possible. The patentee then says (p. 2, lines 92 *et seq.*) :

"I remove this tube from the matrix cylinder by first heating it externally to expand it sufficiently to

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enable it to be unscrewed from the said cylinder, the impression being so slight that very little expansion is necessary."

In my opinion, this could not be done. I doubt, in the first place, if an electrically plated coating could be separated from a mold even if the expansion were sufficient, owing to the adhesion between the coating and mold. In the second place, I do not consider it possible to separate two molds thus united together by applying heat to them, owing to the practically constant coefficients of expansion of all metals. Considering the original record to have a diameter of approximately two inches, then by subjecting the metals to as great a variation as 180 degrees, the diametric expansion of the mold relatively to the record would not be greater than .001 or .0015 of an inch, considering the record to be a steel cylinder and the plating to be of copper. A difference in the diametric expansion of .001 or even .003 of an inch would not be sufficient, since I have found that with ordinary records there should be an expansion of at least .005 inch in order that in separating a duplicate from the mold the record in relief may not be injured. At the outset, therefore, I believe Lioret would find it difficult, if not impossible, to separate his original record from the mold plated thereon.

Having obtained a mold with the record formed at the bottom of a spiral groove in the bore, Lioret inserts a cylindrical blank therein, the blank being just large enough to enter freely. The two are then plunged in hot water so as to soften the blank, which is described as being made of celluloid. The blank being softened, a plunger is introduced, so as to displace the material of the blank and force it into engagement with the record at the bottom of the spiral groove formed in the bore of the mold. It would be impossible to do this, since the water would, by capillarity, enter between the mold and blank and would not



be forced out therefrom by the expansion of the blank, so that the duplicate would be imperfect, owing to the presence of water bubbles.

In order to cause the celluloid blank to soften sufficiently to enable it to be forced outwards or displaced by the plunger, it will be necessary, in carrying out the Lioret process, to heat it to a temperature of at least 140 to 180 degrees. This heating of the blank will cause it to expand longitudinally as well as diametrically, although the diametric expansion would not be sufficient in the Lioret process to cause the blank to engage the record, owing to the depth of the screw-threads in the mold which separate the record from the blank. Upon contracting after the blank has been forced into contact with the record by the action of the plunger or mandrel, the longitudinal shrinkage thereof will engage the threads on the record with the threads on the mold, so that this engagement between the threads will oppose the longitudinal shrinkage and will either destroy the threads on the record or tear the duplicate apart. If in contracting the blank down to 60 degrees Fahrenheit to free it from the mold (a very liberal figure, since with most records a cooling temperature of 40 degrees Fahrenheit or lower is necessary), a blank of the standard length would shrink .035 inches or the distance of three and one-half threads of the standard pitch, it will be manifest that in shrinking to this extent the engaging of the threads on the record and mold would utterly destroy the record for a large part. With the Edison process, the great shallowness of the record (from .00025 to .0005 inches) enables the diametric shrinkage to clear the grooves before the longitudinal shrinkage of the blank can result in injury to the record. I have found, however, in my experiments with the Edison process, that with relatively deep records unless the cooling is very carefully carried out there is danger of the longi-

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tudinal shrinkage resulting in injury, so that with records formed at the bottom of relatively deep grooves, as Lioret describes, I feel sure that the longitudinal contraction would inevitably result in the practical destruction of the record. In carrying out the Edison process, I usually heat the blank after it has been inserted in the mold to a temperature of about 115 degrees Fahrenheit, but this, of course, depends largely upon the character of the material of which the blank is made. This heating does not in any way affect the brittleness of the blank, nor does it make the blank plastic. When complete with the record impressed on it, the blank is almost exactly the same size as before its introduction into the mold—at any rate, it is within .001 or .002 inch of that size. If the Lioret process could be carried out, the record would necessarily be always larger, both externally and internally, than before its introduction into the mold. With the Edison duplicates, the bore is always smaller than before the introduction into the mold, owing to the inward contraction of the blank.

I have found that it is impracticable to heat a blank to the plastic point after its introduction into the mold, and particularly if the record is deep, as is obviously the case with a mold of the Lioret type having a record formed at the bottom of screw-threads, for the reason that when heated to plasticity, the blank will inevitably stick to the mold and it will in consequence be impossible to obtain a perfect record. When, on the contrary, the blank is heated well below the point of plasticity, as in the Edison process, and does not lose its friability, no difficulty of this kind has ever arisen.

To sum up, I find that in the Lioret process, even if it could be carried out, the resulting duplicate is different from that obtained by the Edison process. With Lioret, the record after having obtained the impression is always



larger, both externally and internally, than before the introduction into the mold. With the Edison duplicates, the external diameter is substantially the same after receiving the impression as before the introduction into the mold, but the internal diameter is always slightly less. The Lioret process could not be carried out, because the mold could not be separated from the master, the presence of water between the blank and mold would form water bubbles, the longitudinal shrinkage causing the threads to engage would destroy the record or crack the mold apart, and the heating of the record to the point of plasticity would result in the sticking of the record to the mold. In order that a practical process may be obtained, it is, in my opinion, necessary that the record, after being inserted into the mold should be heated, not to make it plastic but to cause it to expand into engagement with the record without losing its brittleness. I have made many records where the expansion of the mold was alone depended upon to secure the impression, but it is better to use a tapering mandrel, as Mr. Edison describes in his application, as by that use the resulting duplicates are perceptibly better than those obtained by the action of expansion alone.

In the British patent to Young, a process of obtaining duplicates is described but not illustrated, which, in my opinion, is equally impracticable and inoperative. In the Young process, the original record is first coated with "plumbago or other suitable material", so as to make it electrically conductive. Although I have made records under Mr. Edison's supervision with the employment of plumbago, I find that they are not satisfactory, since the finest of plumbago particles obtainable on the market are always larger than some of the indentations on the record. Having coated the original blank with plumbago, a metal is electrically deposited thereon. The

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record is then melted out, and the electro mold is then backed up with a suitable metal. The patent continues:

"To produce a working record from the said electro, this and its case would be warmed or slightly heated by any convenient means and within the said electro would be placed a very thin hollow cylinder, of the same size externally as that of the original wax cylinder upon which the record was first taken. The said thin cylinder may be of any suitable material capable of being rendered plastic by the application of a gentle heat, such as for instance as celluloid, xylonite, vulcanite or the like, and having a highly polished or perfectly smooth external surface, and when this has been rendered pliable by a gentle heat (which may be that given off from the heated electro and its casing) I press the same gently and evenly up to and against the face of the electro, and take an exact impression therefrom, and when the said plastic cylinder has cooled, I am enabled, by slightly collapsing this inwardly, to cleanly and easily remove it from the electro, when I am in possession of an exact duplicate of the original record and all its delicate details."

The Young patent does not state how the blank is to be engaged with the mold, but assuming that it could be evenly, accurately and simultaneously engaged with all parts of the record, it would be possible to obtain a duplicate as described. It would not, however, be possible to remove the duplicate after it was obtained, since the heating of the blank to the point of plasticity would inevitably cause it to stick to the mold and thereby injure the record in whole or part. Furthermore, it would, in my opinion, be impossible to remove the duplicate from the mold in the manner described by Young, *i. e.*, by collapsing the cylinder, because such an operation would injure and probably destroy the record, which is manifestly of the most delicate character. Furthermore, if the duplicate could be removed from the mold by collapsing it without affecting the record, I do not believe that such duplicate



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could be satisfactorily returned to its original cylindrical form and mounted on a base, as described, without also injuring, if not destroying, the record. The Young patent is, however, silent as to the way in which the plastic blank is caused to engage the mold and as to the exact way in which the blank is to be removed from the mold and returned to its original cylindrical shape. It would, therefore, be impossible, without the making of numerous experiments, to carry on the process described by Young, even if it were possible to prevent the sticking of the blank to the mold as I have explained and if it were possible to properly remove the duplicate without sticking.

Not only do the Lioret and Young patents describe impractical and inoperative processes, for reasons which I have explained, but they also explain different processes from that which Mr. Edison has invented and which he describes in the above-entitled application. The essential difference between the Lioret and Young processes and the Edison process is that in the former the heating is effected for the purpose of making the blank plastic, so as to allow the material thereof to be distorted or displaced by the introduction of the mandrel. With the Edison process, the heating is done for the purpose of expanding the blank into engagement with the record, and does not affect the brittleness of the blank. The test of the difference between the two is that with Edison process it is possible to effect a satisfactory, though not loud, reproduction of the record by the use of the heat alone, the expansion being sufficient to cause the blank to engage the record and result in an impression. With the Lioret and Young processes, this would not be possible, since the heating is always a necessary precedent to the subsequent displacement of the material by the use of a mandrel.

CHARLES N. WURTH

Sworn to  
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*Exhibit Edison File-Wrapper A.*

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Sworn to and subscribed before me this 29th day of August 1898.

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J. F. RANDOLPH  
Notary Public  
State of New Jersey

## AFFIDAVIT OF THOMAS A. EDISON.

*State of New Jersey, County of Essex. ss:*

THOMAS A. EDISON, being duly sworn, on oath doth depose and say as follows:—

I am the applicant above-named. The invention described in this application was made by me prior to the year 1893. I have read the affidavit signed and executed by my assistant, Mr. Charles N. Wurth, on even date herewith. The statements made by Mr. Wurth in reference to his experiments connected with my process and his criticisms of the processes described in the Lioret and Young patents are true, to the best of my knowledge and belief. The exhibit mold No. 54 referred to by Mr. Wurth was to my knowledge made by him under my direction prior to the year 1893, and records were made from that mold prior to that time.

THOMAS A. EDISON

In witness whereof I have hereunto set my hand and affixed my seal this 29th day of August, 1898.

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J. F. RANDOLPH  
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HON. COMMISSIONER OF PATENTS,

*Sir:* For reasons which I will explain hereafter, without prejudice and without acknowledging the pertinence of the references, I amend as follows:—

Cancel claims 1, 5, 6, and 11, and renumber the remaining claims.

Present claim 5 (former 8), lines 8 and 9, erase the words "mechanically expanding said blank into intimate contact" and substitute—subjecting the expanded blank to pressure to more intimately engage it—

Present claim 6 (former 9), lines 8 and 9, erase the words "mechanically expanding the blank into intimate engagement" and substitute—subjecting the expanded blank to pressure to more intimately engage it—

Present claim 8 (former 11), line 3, erase "plastic" and substitute—an expansible— Line 4, erase "plastic" and substitute—blank—

I file herewith two affidavits, one of Mr. Edison and the other of his assistant Charles N. Wurth, from which it appears that the process described in this application was fully reduced to practice prior to the year 1893, and hence before the date of either of the references on which the Examiner now relies. In these affidavits, two exhibits are referred to, namely, a matrix or mold and a duplicate blank made therefrom, which exhibits were constructed and produced prior to the year 1893. These exhibits will be personally handed to the Examiner, as it is not desired to make them a part of the record of the case, since they may be of use in the event of a further interference. The Examiner will see by examining these exhibits that Mr. Edison has produced the seemingly impossible, and has been able to secure absolutely accurate reproductions of such a delicate original as a phonogram blank.

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In the affidavit of Mr. Wurth, he very carefully considers the two references to which the Examiner refers, and it is believed has conclusively demonstrated that neither of the processes described by Lioret nor Young would be operative. Whether this is so or not, he has shown that the Lioret and Young processes are different from that which Mr. Edison has invented, and particularly in the respect that with the references the heating of the blank is performed for the purpose of making it plastic so that the material of the blank may be afterwards displaced and caused to engage the mold by the action of a mandrel, while with the Edison process the heating of the blank is performed solely for the purpose of causing it to expand into engagement with the matrix or mold. As Mr. Wurth points out, the essential test of the difference between the several processes is that with the references the heating of the blank must be always followed by a displacement of the material by mechanical means, while with the Edison process the heating of the blank may be relied upon solely for the purpose of making the duplicates. It is pointed out by Mr. Wurth, and proved by him, that with the Lioret process the matrix or mold could not be separated from the master; that duplicates could not be obtained by that process, at least with blanks of the standard size; that the immersing of the mold and blank in water would result in the formation of water bubbles, which would, of course, injure the record on the duplicate; and that the heating of the duplicate to the point of elasticity would cause it inevitably to adhere to the mold. These are vital and fundamental defects, and the fact that so far as is known the Lioret process is not carried out commercially would seem to demonstrate that it is not a successful and practicable process.

So far as the Young process is concerned, it is obvi-



ously entirely foreign to anything which Mr. Edison does. At the same time, Mr. Wurth points out that from his experience in these matters the Young process could not be carried out as the patent states without the making of independent and exhaustive experiments, so that that patent considered as a publication is not such a full, clear and exact description as will enable anyone skilled in the art to carry the invention into effect. With the Young process, the heating of the blank to plasticity would also cause it to stick to the mold, and this, taken in connection with the crude way of removing the blank by collapsing it, would inevitably result in the destruction of a large part, if not all, of the record.

When the Examiner will consider that Mr. Edison's process was invented before the date of either of the references, but that he had spent his time and money for the practical development of the process to the point of absolute perfection, and that the references which are cited show inoperative and different processes covered in patents which are of the "paper" variety, it will be admitted that the present application stands in rather a privileged light. If Edison was the first to produce a process capable of being satisfactorily carried into effect, and if the references do not describe processes which could be commercially carried out, then it is submitted, and on this point the examiner has agreed with applicant, that all questions of doubt as to patentability should be resolved in applicant's favor.

The claims which have been erased are canceled in view of the fact that they appear to cover processes which are broader than applicant's invention, namely, processes wherein the blank in the process of duplication is displaced instead of being expanded. Neither the present first nor second claim is met by the references, for the reason that in the references the blank is not engaged

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with the mold by a change in temperature. In both the references, the heating of the blank is, as stated, performed for the purpose of making the blank plastic, and the engagement is subsequently effected by mechanical means. The first two claims would cover a process wherein the blank is introduced into the mold and the record is obtained by simply expanding the blank by heat.

The present third and fourth claims are not met by either of the references, because the said claims are limited to the expansion of the blank into intimate engagement with the record of the mold. With the references, the blank is not expanded but is displaced. With the Edison blank, as Mr. Wurth points out in his affidavit, the duplicate, after leaving the mold, is of approximately the same size as before its admission into the mold. Hence, a true expansion takes place, as when a rubber band is stretched. With both references, the blank, after leaving the mold, is always larger than when it entered it, so that there is a true displacement; as, for example, when a plastic, non-elastic mass is subjected to pressure.

The fifth and sixth claims are not met by either reference, for the reason that said claims cover separate and distinct steps, namely, the expansion of the blank by heat into engagement with the record, and the subsequent subjection of the expanded blank to pressure to more intimately engage it with such record. Edison, therefore, uses in his preferred process two distinct expanding steps, one the result of heat and the other of mechanical pressure. In both references, a single displacing process is carried on, the material of the blank being displaced by the application of pressure alone.

The present seventh claim is substantially the same as claims 4 and 5, except that it is limited to the backing of the matrix or mold, and the same remarks are applicable thereto.



The present eighth claim is also limited to the expansion of the blank by the application of heat, and is, for the reasons explained, distinguished from the references.

The ninth claim is not only limited to the expansion of the blank by heat, but to the use of a blank having a higher co-efficient of expansion than the matrix or mold, so that when both are placed in a heating chamber the blank will be expanded into contact with the record, notwithstanding the slower expansion of the mold itself.

The tenth claim is limited to the exact process, broadly expressed, which applicant uses, wherein a matrix or mold is obtained by a process of vacuous deposit and the duplicates are secured therefrom by a process of expansion.

In view of what has been said above, it is hoped that the case as now presented may be allowed.

Respectfully,

THOS A EDISON

by RICH'D N. DYER

Attorney for Edison.

NEW YORK, September 1, 1898.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., Sept. 15, 1898.

This application has been reconsidered in view of applicant's affidavits and amendment of the second instant.

Claims 3, 4, 7 and 8, are each rejected upon the English patents of record and for the reasons of record.

Claim 10, is rejected upon the English patents of record, in view of the patent to Edison, No. 526,147, of record. There would be no invention in employing the process set forth in the Edison patent for obtaining the matrices disclosed in the English patents.

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The affidavits filed in this case have been very carefully considered. They are not however regarded as sufficient to enable the Office to determine whether or not the processes set forth in the English patents are operative. The said processes must be regarded as operative until their inoperativeness is established.

As at present advised, the remaining claims are allowable.

S. E. F.

J. T. NEWTON, Exr.

HONORABLE COMMISSIONER OF PATENTS,

*Sir:*—By the last amendment applicant requested the erasure of claim 11 which was presented by amendment of May 26, 1898. This was a typographical error, as appears from the succeeding statement in the same amendment where reference is made to "claim 8 (former 11)". The claim which applicant intended to have erased was the 12th claim presented by the amendment of May 26, 1898, and which is now numbered 8.

Please amend, therefore, by erasing claim 8 (former 12), and by reinstating former claim 11 properly amended as follows:

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—8. The method of producing phonograms, which consists in securing a hollow metallic mold or shell containing the reverse record, placing an expansible blank in said mold, expanding both by heat, impressing the record in the blank, contracting the phonogram so made by the withdrawal of heat, and removing the phonogram from the mold, substantially as set forth.—

Reconsideration of claims 3, 4, 7 and 10 is respectfully requested.

It is noted that the Examiner does not agree with applicant in his characterization of the processes of the



English patents as being operative. Applicant believes that the inoperativeness of the references is apparent on their face. So far as the Lioret patent is concerned, it seems clear that the electro-deposit could not be removed from the original matrix, that a record could not be obtained in the mold by immersing the mold and record in hot water and by the application of a tapered plunger, and that after the blank had been forced into the mold, the two could not be separated without entirely destroying the record, assuming that a record could be made. Regarding the Young patent, it is to be characterized as being too indefinite to stand as a reference, no statement being made as to how the blank is to be engaged in the mold, and as being inoperative because a blank having a record impressed thereon could not be removed without destroying the record by collapsing the blank. Not only are both of the references capable of this legitimate criticism, but it is to be noted that they do not meet the terms of the rejected claims, since with both references the blanks are heated to the point of plasticity, and the engagement with the mold is effected by actually displacing the material of which the blank is formed. This is not the equivalent of applicant's step of expanding the blank into engagement with the mold, the blank being heated below the point of plasticity necessarily, because otherwise it would stick to the mold and would destroy the record if an attempt were made to withdraw it. Furthermore, the Examiner's attention is directed to the fact that applicant has made out a showing of his prior invention, and in view of this fact, the references ought to be construed in the strictest possible light. The Examiner will see that if the references are not considered in this way, a premium is offered to inventors to come into the Office with applications on partly perfected devices. As it is, the Courts have universally held that the object

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If upon reconsideration the Examiner is not disposed to allow the rejected claims, it is requested that such action be made as will permit the application to be appealed.

Very respectfully,

RICHD N. DYER  
Attorney for Edison.

NEW YORK, September 7, 1899.

UNITED STATES PATENT OFFICE,  
WASHINGTON, D. C., October 14, 1899.

Claims 3, 4, 7 and 10 are again and finally rejected on the references and for the reasons of record.

Since the last action in this case, the examiner has seen celluloid records said to have been produced by a process substantially identical with that set up in the English patent to Young. These records were successful in every sense and convince the examiner that the Young process is operative.

R. H. S.

J. T. NEWTON, Ex.

UNITED STATES PATENT OFFICE,  
WASHINGTON, D. C., January 18, 1900.

Upon a further investigation of the process referred to in the last office letter as being the same as Young's process, the examiner has found that it was not identical with the Young process. That process as set forth is as follows:

The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, render-



ing the surface of the wax cylinder electrically conductive and electrolytically depositing metal thereon, forming a matrix and then outwardly expanding under pressure within the matrix, a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix and finally removing the cylinder or tube by direct longitudinal movement.

It is thought that the above claim would distinguish from both Young and Lioret and if applicant will make the same within thirty days, this application will probably be put in interference with other pending applications.

J. T. NEWTON, Ex.

HONORABLE COMMISSIONER OF PATENTS,

*Sir:*—In the above entitled application, I hereby appoint as my substitute Messrs. Dyer, Edmonds & Dyer (a firm composed of Richard N. Dyer, Samuel O. Edmonds and Frank L. Dyer) of No. 31 Nassau Street, New York City, and request that all further communications be sent to them.

Very respectfully,

RICHARD N. DYER  
Attorney of Record.

NEW YORK, March 20, 1900.

HONORABLE COMMISSIONER OF PATENTS,

*Sir:*—Availing ourselves of the suggestion of the Examiner, we submit the following amendments:

Claim 3, line 6, erase "and."

C Same claim, line 7, after "mold" insert — the cylindrical blank being sufficiently thick to maintain its shape during and after the act of a disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement,—

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Claim 4, line 7, erase "and".

Claim 4, line 7, erase "remove" and substitute—disengage—

C' Same claim, line 8, after "mold" insert — the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement,—

Claim 7, line 6, erase "and".

C<sup>2</sup> Same claim, line 7, after "mold" insert — the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement,—

Claim 10, line 5, erase "and".

C<sup>3</sup> Same claim, line 7, after "mold" insert — the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement,—

We presume as above amended, the rejected claims will be no longer objectionable to the Examiner.

We call the Examiner's attention to the fact that on January 18th 1900 it was stated that the case might be involved in interference with other applications. Unless the interfering applications are in condition for interference, we hope that the allowance of this case may not be delayed.

Very respectfully,

THOMAS A. EDISON,

By DYER EDMONDS & DYER

His Attorneys.

NEW YORK, March 20, 1900.



HON. COMMISSIONER OF PATENTS,

*Sir:* We submitted an amendment and argument in the above-entitled application yesterday. Today we note in the Gazette the grant of a patent No. 645,920 to Lambert, for Method of Reproducing Phonograph Records, dated March 20, 1900. The first claim of this patent is, word for word, identical with the eleventh claim introduced in this application by amendment of January 19, 1900, in response to the Examiner's letter of January 18, 1900. We presume the Lambert patent issued inadvertently, and request an interference therewith.

Very respectfully,

THOMAS A. EDISON

By DYER EDWARDS & DYER

His Attorneys.

NEW YORK, March 21, 1900.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., April 13, 1900.

This application has been considered in view of applicant's amendment filed March 21, 1900 and his letter filed March 22, 1900. The amendment said to have been made in this case on January 19 has not been received at the office.

Applicant has amended his claims in such a way as to introduce the thickness of the record material as an element thereof. The drawing filed in the case shows a thick record material but no mention of the same has been made in the specification, statement of invention or claims. Applicant is therefore required to lay some foundation for this amendment in his specification and also to file a supplemental oath thereto in accordance with Rule 48.

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J. T. NEWTON, Ex.

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HONORABLE COMMISSIONER OF PATENTS,

Sir:—We note that our amendment of January 19th 1900 in response to the Official suggestion of the day previous, has not been received by the Examiner. We therefore amend by inserting the following claim:

- 11. The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and then outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement.—
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Page 3, line 12, after "mold" insert — and said phonograms are made sufficiently thick to maintain their shape during and after the act of disengagement from the matrix, as will be explained—

D'

Page 4, line 10, after "blank" insert—by direct longitudinal movement—

Page 5, line 3, after "common" insert — and which is sufficiently thick to maintain its shape during and after the act of disengagement from the matrix—

D<sup>2</sup>

A supplemental oath is submitted herewith in support of the amendments above made to the specification.

Regarding the failure of the Office to receive our amendment of January 19th 1900, we desire to say that we have been assured by our mailing clerk that the amendment in question was properly deposited in the mails, and we presume that the amendment has mis-



carried in the Patent Office and will be possibly found in some other examining division.

The interference referred to in our letter of the 21st ult. is respectfully requested.

Very respectfully,

THOMAS A. EDISON,

By DYER EDMONDS & DYER

His Attorneys.

NEW YORK, April 17, 1900.

AFFIDAVIT OF THOMAS A. EDISON.

*State of New Jersey, County of Essex, ss.*

THOMAS A. EDISON, being duly sworn, on oath doth depose and say that he is the applicant above named; that the subject-matter of the foregoing amendment was part of his invention, was invented before he filed his original application above identified for such invention, was not known or used before his invention, was not in public use or on sale in this country for more than two years before the date of his application, and has not been abandoned.

THOMAS A EDISON

Sworn to and subscribed before me this 17th day of April 1900.

(NOTARIAL SEAL)

RICHD N. DYER

Notary Public.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., May 8, 1900.

This application is in condition for allowance.

The following claim is suggested in accordance with Rule 96 and if applicant will make the same, it will be placed in interference:

The herein-described process of molding sound-records

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in celluloid, which consists of softening a celluloid tablet and then forcing the same against a suitable matrix by its own expansive force, substantially as described.

Applicant is required to respond to this action within thirty days, otherwise the other application will be sent to issue or such other action taken therein as the condition thereof shall require.

R. H. S.

J. T. NEWTON, Ex.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., May 16 1900.

Your case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before the 8th day of June 1900, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and then outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement.

The above issue is your claim 11 and is substantially claim 1 of an application of Thomas B. Lambert, of Chicago, Ill. patented March 20, 1900, Pat. No. 645,920; assor of 3/5 to Brian F. Philpot and Joseph Powell of Chicago, Ill., whose attys., are Banning and Banning and Sheridan, Marquette Building, Chicago, Ill.

J. T. NEWTON, Ex.



Defendant's Exhibit Edison File-Wrapper B.

UNITED STATES OF AMERICA.

DEPARTMENT OF THE INTERIOR,

PATENT OFFICE.

*To all persons to whom these presents shall come, Greeting:*

This is to certify that the annexed is a true copy from the Records of this office of the File Wrapper and Contents subsequent to June 16, 1900, in the matter of the Letters Patent of Thomas A. Edison, Number 713,209, granted November 11, 1902, for Improvement in Process of Duplicating Phonograms—

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this 23d day of January, in the year of our Lord one thousand nine hundred and four and of the Independence of the United States of America the one hundred and twenty-eighth.

F. I. ALLEN

Commissioner of Patents.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., July 18, 1900.

Your case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before the 10th day of Aug., 1900, with the subject of the invention, and name of party filing it,

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indorsed on the envelope. The subject-matter involved in the interference is .

The herein-described process of molding sound-records in celluloid, which consists of softening a celluloid tablet and then forcing the same against a suitable matrix by its own expansive force.

The above issue is your claim 12 and is claim 1 of an application of Frank L. Capps of Newark, New Jersey, assor to the American Graphophone Co., Corp. of W. Va., whose atty. is Philip Mauro of #620 F. Street, Washington, D. C.

WM J. RICH  
Acting Exr

R. H. S.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., May 4, 1901

You are hereby notified of the application of one Eldridge R. Johnson of Philadelphia, Pa., whose atty. of record is Horace Pettit, #1012 Stephen Girard Bld'g., Philadelphia, Pa., with which your application is adjudged to interfere on the issue set forth in interference No. 20,534.

Hearing upon the question of admission of said Johnson to interference is set for 10 A. M. May 11, 1901, in accordance with the provisions of Rule 129.

J. T. NEWTON Ex

J. H. L.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., January 31, 1902.

An award of priority in interference #20,534, Lambert *vs.* Edison, having been rendered in favor of the pres-



ent applicant, this application has been duly considered.

Official action in this case is suspended until February 12, 1902, in view of further interference proceedings.

At the expiration of the period of suspension, applicant is requested to call this case up for action.

J. T. NEWTON Ex

J. H. L.

HON. COMMISSIONER OF PATENTS,

Washington, D. C.

*Sir:* In accordance with official letter of January 31st, 1902, we beg to call the attention of the Examiner to the above case.

Respectfully,

THOMAS A. EDISON.

By DYER, EDMONDS & DYER

His Attorneys.

NEW YORK, February 14th, 1902.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., March 8, 1902.

This action is taken in view of the letter from applicant filed then 17th ultimo.

The following claims are required to be filed within fifteen days from date under the provisions of Rule 96.

The process of duplicating sound records that consists in and impressing a plastic record tablet against a suitable matrix by its own expansive force.

The method of producing hollow cylindrical phonograms which consists in obtaining a mold having a reverse phonogram record on the inner wall of a cylindrical opening, forming a hollow cylindrical plastic phonogram within said mold, releasing the phonogram from the mold

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The method of producing phonograph cylinders which consists in placing within a hollow cylindrical record mold or matrix, a hollow cylindrical phonograph blank, of sufficient thickness to maintain its shape during and after its engagement with the matrix, outwardly expanding such blank against said matrix, disengaging the impressed record cylinder from the matrix, and withdrawing said record cylinder from the matrix by direct longitudinal movement.

The method of producing phonograms which consists in placing within a hollow cylindrical record matrix a hollow cylindrical phonograph blank of sufficient thickness to maintain its form under normal conditions, softening said blank by heat and expanding the same while heated so as to take the record from the matrix, shrinking the phonogram so made by change of temperature, and withdrawing the same from the matrix by direct longitudinal movement.

The method of producing phonograms which consists in placing within a hollow matrix a hollow body of plastic material, said body being a cylinder on its outer surface and having a tapering central longitudinal aperture, softening said body by heat and expanding it into the matrix by the longitudinal movement of a tapering plunger within the plastic body, shrinking the plastic material and withdrawing it from the matrix by direct longitudinal movement.

J. H. L.

J. T. NEWTON EX

HONORABLE COMMISSIONER OF PATENTS,

*Sir:* We amend the above entitled application by adding the following claims:

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~~1. The process of duplicating sound record that consists in impressing a plastic record tablet against a suitable matrix by its own expansive force.~~

~~2. The method of producing hollow cylindrical phonograms which consists in obtaining a mold having a~~

Mr Sub. Spec.  
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reverse phonogram record on the inner wall of a cylindrical opening, forming a hollow cylindrical plastic phonogram within said mold, releasing the phonogram from the mold by a difference of temperature between the mold and phonogram sufficient to entirely clear the surfaces, and removing the phonogram from the mold by direct longitudinal movement.

3. The method of producing phonograph cylinders which consists in placing within a hollow cylindrical record mold or matrix a hollow cylindrical phonograph blank, of sufficient thickness to maintain its shape during and after its engagement with the matrix, outwardly expanding such blank against said matrix, disengaging the impressed record cylinder from the matrix, and withdrawing said record cylinder from the matrix by direct longitudinal movement.

4. The method of producing phonograms which consists in placing within a hollow cylindrical record matrix a hollow cylindrical phonograph blank of sufficient thickness to maintain its form under normal conditions, softening said blank by heat and expanding the same while heated so as to take the record from the matrix, shrinking the phonogram so made by change of temperature, and withdrawing the same from the matrix by direct longitudinal movement.

5. The method of producing phonograms which consists in placing within a hollow matrix a hollow body of plastic material, said body being a cylinder on its outer surface and having a tapering central longitudinal aperture, softening said body by heat and expanding it into the matrix by the longitudinal movement of a tapering plunger within the plastic body, shrinking the plastic material and withdrawing it from the matrix by direct longitudinal movement.—

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Change the numerals of the remaining claims accordingly.

Very respectfully,

THOMAS A. EDISON,

By DYER EDMONDS & DYER

His Attorneys.

NEW YORK, March 10, 1902

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., March 25, 1902.

This action is made in view of the amendment made the 11th instant.

It appears upon reconsideration that claim 13, former 8, should have been rejected in view of Lioret, October 30, 1894, #528,273, or Lioret cited, which action is now taken.

Responsive action on or before April 8th, 1902, is required under the provisions of Rule 96.

J. H. L.

J. T. NEWTON EX

HON. COMMISSIONER OF PATENTS,

~~Sir: Present claim 13 (former 8), introduced by amendment dated September 7, 1899, is amended by adding after the word "mold", line 6 thereof, the following—by a direct longitudinal movement—.~~

The case is believed to be in allowable condition.

Very respectfully,

THOMAS A. EDISON,

By DYER EDMONDS & DYER,

His Attorneys.

NEW YORK, March 26, 1902.



## UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., April 11, 1902.

This action is taken in view of the amendment filed the 28th ultimo.

Claim 13 as amended is rejected in view of Young's English patent cited, however, if it be defined therein that the record cylinder is sufficiently thick to maintain its shape during and after its removal from the matrix, the claim will be differentiated from the Young patent, but it may be rendered the same in substance as a claim allowed.

J. H. L.

J. T. NEWTON EX

HON. COMMISSIONER OF PATENTS,

Sir: We wish to submit a new specification and drawings, for the purpose of consolidating the several amendments and improving the form of expression and illustration. So many amendments have been made in the claims, which appear in a number of separate papers, that we consider it desirable also to present the claims in a single paper.

We, therefore, amend as follows:—

Cancel the drawing and substitute the three sheets submitted herewith.

Erase the specification and claims, and substitute the following:—

## SPECIFICATION.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, THOMAS A. EDISON, a citizen of  
 Sub. Spec. the United States, residing at Llewellyn Park, in the  
 County of Essex and State of New Jersey, have invented  
 certain new and useful IMPROVEMENTS IN PROCESSES OF

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DUPLICATING PHONOGRAMS (Case No. 994), of which the following is a specification:—

The object I have in view is to produce a practical process for the duplication of phonographic records, whereby a practically unlimited number of duplicate phonographic records may be obtained, which will be absolutely identical in every respect with the original record. Generally, I propose to construct a suitable matrix, preferably in metal, and by its use to impress duplicate phonograms with a phonographic record thereon, such phonograms being preferably constructed of a material having a greater coefficient of expansion than the material of the matrix or mold.

By my process, the duplicate phonogram, or the surface thereof, may be and preferably is constructed of a material too hard for the satisfactory cutting of an original record therein by the usual phonographic recorder, whereby the duplicate phonograms may be made more durable than it is possible to make original records; but the duplicate phonograms may obviously be made of a softer material.

My improved process can be carried out for the reproduction of phonographic records of any desired form, either flat disks or hollow cylinders, but it has been specially devised for use in connection with the duplication of records of the latter type. For the duplication of cylindrical phonographic records from a tubular matrix, my improved process also provides for the effective removal of the finished duplicate from the matrix without injury to the record surface of the former.

In carrying my process into effect, I first construct a matrix carrying a negative representation of the record, which matrix can be produced by any of the known processes, as, for example, those indicated in my patent No. 484,582, dated October 18, 1892. As I explain in this patent, an original phonographic record having a surface



of the usual waxlike material is first secured and its surface covered with a coating of conducting material, in order to permit the original record to be electroplated. This conducting coating can be, and preferably is, applied by a process of vacuous deposit, as I describe in my patent No. 527,147, dated September 18, 1894, by placing the record in a vacuum chamber in which a metal is vaporized by an electric arc produced between electrodes of the metal, the metallic vapor depositing as a thin, uniform coating on the original record. I prefer to apply a preliminary coating by a process of vacuous deposit, for the reason that the highly comminuted condition of the vaporized metal permits the coating to form as a uniform film, following accurately all the variations of the record, however minute. Instead of coating the original record with a vaporized metal, it may be coated with a very thin layer of specially prepared plumbago of exceedingly great fineness, or instead thereof gold-leaf or silver salts reduced by chemical reagents to the metallic state may be used for the same purpose.

Having thus applied a very thin preliminary coating to the original record, the latter is immersed in an electroplating bath and electroplated with a metal to the desired thickness, thereby forming a shell enclosing the original record, which shell carries on its bore an accurate negative representation of that record. Preferably this shell is suitably encased in a close-fitting cylindrical jacket, although if the electroplating is carried on long enough to form an electroplated coating of sufficient thickness a jacket need not be used. The original record is removed from the electroplated matrix obtained as described, either before or after the jacket, if used, is applied to the shell. This removal of the original record can be effected either by dissolving or melting the waxlike material, or by contracting the original record radially and removing it by a

direct longitudinal phonographic hollow metal, carrying its inner surface well-known and obvious that familiar to the

Having obtained representation duplicated, I as follows:— records are produced by a higher coefficient or mold, and maintain their engagement from the under normal less than the blank may be been thus placed in a matrix and the alone is, brought in contact with the record whereby the negative is obtained with absolute blank. The estimate engagement or mold may be maintaining the therein in a hollow of a material having the matrix or negative to receive the impression



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direct longitudinal movement. In the case of cylindrical phonographic records, the resulting matrix will be a hollow metal cylinder or tube, or one internally faced with metal, carrying the phonographic record in relief upon its inner surface. While I have indicated convenient and well-known methods for producing the matrix, it will be obvious that the matrix can be obtained in any other way familiar to those skilled in the art.

Having obtained a suitable matrix carrying a negative representation of the original phonographic record to be duplicated, I proceed with the duplication of the records as follows:—The blanks which are to receive the duplicate records are preferably composed of a material having a higher coefficient of expansion than that of the matrix or mold, and said blanks are made sufficiently thick to maintain their shape during and after the act of disengagement from the matrix, as will be explained. The blank under normal temperatures is of a diameter very slightly less than the bore of the matrix or mold, whereby the blank may be inserted in the same. After the blank has been thus placed within the matrix or mold, both the matrix and the blank contained therein are, or the blank alone is, brought to a higher temperature, whereby the blank will expand and will be brought into intimate contact with the record surface of the matrix or mold, whereby the negative record thereof will be impressed with absolute accuracy upon the surface of the blank. The expansion of the blank into this intimate engagement with the interior of the matrix or mold may be effected in any suitable way, such as by maintaining the matrix or mold with the blank contained therein in a heated atmosphere. By making the blank of a material having a higher coefficient of expansion than the matrix or mold, the blank will be properly expanded to receive the impression of the record, notwithstanding



the fact that both the blank and the matrix or mold may be subjected to the same temperature.

In order to facilitate the operation and make the resulting duplicate record somewhat sharper, I prefer to introduce a tapering mandrel within the blank after the blank has been placed in the matrix or mold and heat applied to the blank as explained, and to force the mandrel tightly within the blank after the latter has been expanded into engagement with the record, whereby the blank will be further expanded mechanically into absolute intimacy with the record, after which the mandrel will be immediately withdrawn. With blanks made of sufficiently viscous material, the entire expansion may be effected mechanically by forcing a tapering mandrel within the same.

After the blank has been expanded so as to receive the impression of the matrix or mold, it is removed by first shrinking it radially in any suitable way, as in a refrigerating chamber, and by then withdrawing the resulting duplicate record by a direct longitudinal movement. Owing to the shallowness of the phonographic record groove, this radial shrinkage of the duplicate record effects a sufficient separation of the surfaces of the matrix and of the duplicate record to prevent injury to the surface of the duplicate record due to any longitudinal contraction thereof.

I find that by the process above described, and particularly when a matrix or mold is obtained by a process of vacuous deposit as explained, duplicate phonographic records can be obtained which will be accurate reproductions of the original records and be free from extraneous noises, and wherein the quality and intensity of the original vibrations will be reproduced with absolute faithfulness. I find moreover that since by this process there is little or no wear upon the matrix or mold, a practically un-

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limited number of duplicates may be obtained from a single matrix or mold.

The degree of heat necessary to properly expand the blank will depend largely upon the material of which the blank is formed and upon the closeness of fit of the blank when inserted within the matrix or mold. For the same reasons, the extent of the reduction of temperature in chilling and shrinking the duplicate record will vary to a considerable extent.

The invention is illustrated in the accompanying drawings, for convenience, in connection with a cylindrical phonogram. In these drawings,

Figure 1 is a sectional view, showing a matrix or mold with a blank introduced therein prior to the expansion of the blank into engagement with the record surface of the matrix;

Figure 1<sup>a</sup>, a section through a part of the walls of the blanks and matrix, very greatly enlarged;

Figure 2, a view similar to figure 1, showing the blank expanded into engagement with the matrix and illustrating also a tapered mandrel forced into the blank;

Figure 2<sup>a</sup>, a view corresponding to figure 1<sup>a</sup>, showing a part of the walls of the matrix, blank and mandrel of figure 2, very greatly enlarged;

Figure 3, a view corresponding to figures 1 and 2, with the tapered mandrel removed and illustrating the formed duplicate as having been contracted radially preparatory to being removed from the blank by a direct longitudinal movement; and

Figure 3<sup>a</sup>, a section, very greatly enlarged, corresponding to figures 1<sup>a</sup> and 2<sup>a</sup>, and illustrating the relative relation between the duplicate and matrix prior to the removal of the former.

In these views, corresponding parts are represented by the same letters of reference.



A represents the matrix or mold carrying on its bore a negative representation of the record to be reproduced. B represents the blank to be duplicated, which is preferably provided with a tapered bore, as is now common, and which is of sufficient thickness to maintain its shape during and after the act of disengagement from the matrix. This blank is turned down so that it may be inserted within the matrix or mold with a close fit (as shown in figures 1 and 1<sup>a</sup>). The blank to be duplicated may be, and preferably is, of a harder material than can be practically or satisfactorily engraved, indented or cut by a phonographic recorder, whereby the duplicate phonographic records will be more durable than could be obtained in the first instance by the operation of a recording or indenting device actuated directly by the sound waves. These blanks may, therefore, be made of a relatively hard material, such as asphalt; or of stearic acid or stearate of soda mixed with varying proportions of fine precipitates, such as chalk, slacked lime or lampblack; or waxes or resins may be used, such as sealing-wax or shellac, mixed with fine precipitates, like chalk; or polished ebonite, vulcanized hard rubber, or celluloid may be used; or glue may be employed, either alone or mixed with precipitates, such as chalk.

C (figures 2 and 2<sup>a</sup>) represents a tapered mandrel, which may be inserted within the blank B. D represents a support for the matrix or mold and for the blank within the same, said support having an opening E therein, whereby the mandrel C may be moved longitudinally within the blank.

In carrying out the process, I first introduce the blank within the matrix with as close a fit as practical (as shown in figures 1 and 1<sup>a</sup>), after which the mandrel C is inserted within the blank. These parts are then subjected to heat, such as by being maintained in a heated atmosphere,

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whereby the blank will, by reason of its greater coefficient of expansion than the matrix or mold, be expanded into intimate contact with the record surface of the latter, and an impression of such record will be accurately received on the blank. When the blank has been thus expanded into engagement with the matrix or mold, the mandrel C is forced tightly within the blank, so as to further expand it mechanically, whereby the blank will be forced into absolute intimacy with the record and an impression will be received on the blank which will be clear, sharp and an absolutely faithful reproduction of the original record. After the mandrel has been forced within the blank, it is immediately withdrawn and the blank is then chilled in any suitable way, such as by placing the matrix with the blank contained therein in a refrigerating chamber. In this way the blank or duplicate will shrink or contract radially (as shown in figures 3 and 3<sup>a</sup>) sufficiently to be removed from the matrix or mold by a direct longitudinal movement. Owing to the extreme shallowness of the phonographic record groove, a sufficient radial separation between the resulting duplicate and the matrix or mold will take place to prevent any longitudinal contraction of the duplicate from injuring the record surface thereof.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is as follows:—

1. The process of duplicating sound records that consists in impressing a plastic record tablet against a suitable matrix by its own expansive force.

2. The method of producing hollow cylindrical phonograms, which consists in obtaining a mold having a reverse phonogram record on the inner wall of a cylindrical opening, forming a hollow cylindrical plastic phonogram within said mold, releasing the phonogram from the mold by a radial contraction of the phonogram sufficient to entirely clear the surfaces, and removing the



phonogram from the mold by direct longitudinal movement.

3. The method of producing hollow cylindrical phonograms which consists in obtaining a mold having a reverse phonogram record on the inner wall of a cylindrical opening, forming a hollow cylindrical plastic phonogram within said mold, releasing the phonogram from the mold by a reduction in temperature sufficient to entirely clear the surfaces, and removing the phonogram from the mold by direct longitudinal movement.

4. The method of producing phonograph cylinders which consists in placing within a hollow cylindrical record mold or matrix, a hollow cylindrical phonograph blank of sufficient thickness to maintain its shape during and after its engagement with the matrix, outwardly expanding such blank against said matrix, disengaging the impressed record cylinder from the matrix, and withdrawing said record cylinder from the matrix by direct longitudinal movement.

5. The method of producing phonograms which consists in placing within a hollow cylindrical record matrix a hollow cylindrical phonogram blank of sufficient thickness to maintain its form under normal conditions, softening said blank by heat and expanding the same while heated so as to take the record from the matrix, shrinking the phonogram so made by change of temperature, and withdrawing the same from the matrix by direct longitudinal movement.

6. The method of producing phonograms which consists in placing within a hollow matrix a hollow body of plastic material, said body being a cylinder on its outer surface and having a tapering central longitudinal aperture, softening said body by heat and expanding it into the matrix by the longitudinal movement of a tapering plunger within the plastic body, shrinking the plastic ma-

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terial and withdrawing it from the matrix by direct longitudinal movement.

7. The process of duplicating phonograms having a phonographic record thereon, which consists in forming a matrix or mold wherein the original record will be reproduced in relief, in loosely engaging a blank phonogram with said matrix, and in finally intimately engaging the blank phonogram with said matrix or mold by changes in temperature, substantially as set forth.

8. The process of duplicating phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, and in intimately engaging a blank phonogram with the said matrix or mold by a change in temperature, substantially as set forth.

9. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the continuous cylindrical blank to be reproduced within said matrix or mold, in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, the cylindrical blank being sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth.

10. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram so as to form a matrix or mold, in inserting the blank to be reproduced within said matrix or mold, in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, in finally



shrinking the blank to disengage it from the matrix or mold, the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth.

11. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, and in finally subjecting the expanded blank to pressure to more intimately engage it with said record, substantially as set forth.

12. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, in subjecting the expanded blank to pressure to more intimately engage it with such record, and in finally chilling the blank to remove it from the matrix or mold, substantially as set forth.

13. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram to form a matrix or mold, in covering said matrix or mold with a metal backing, in introducing the continuous cylindrical phonogram to be reproduced within said matrix or mold,

in expanding the blank to disengage it from the matrix or mold, the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth.

14. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, and in finally subjecting the expanded blank to pressure to more intimately engage it with said record, substantially as set forth.

15. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, and in finally subjecting the expanded blank to pressure to more intimately engage it with said record, substantially as set forth.

16. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram to form a matrix or mold, in covering said matrix or mold with a metal backing, in introducing the continuous cylindrical phonogram to be reproduced within said matrix or mold,

in expanding said phonogram into intimate engagement with the record in relief carried by the bore of said matrix or mold, the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth.

14. The method of producing phonograms, which consists in securing a hollow metallic mold or shell containing the reverse record, placing in said mold an expansible blank sufficiently thick to maintain its shape during and after its removal from the mold, expanding both by heat, impressing the record in the blank, contracting the phonogram so made by the withdrawal of heat, and removing the phonogram from the mold by a direct longitudinal movement, substantially as set forth.

15. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram so as to form a matrix or mold, in inserting within said matrix or mold a blank to be reproduced made of a material having a higher coefficient of expansion than said matrix or mold, and in heating the blank and matrix carried thereby, whereby the blank will be expanded into intimate engagement with the record in relief carried by the bore of said matrix or mold, substantially as set forth.

16. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing in a vacuum a metal vapor upon the original phonogram, electroplating a metal thereon so as to form a matrix or mold, in inserting the continuous cylindrical blank to be reproduced within said matrix or mold, in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, the cylindrical blank being made sufficiently thick to main-



tain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth.

17. The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and then outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement.

18. The herein described process of molding sound records in celluloid, which consists of softening a celluloid tablet and then forcing the same against a suitable matrix by its own expansive force, substantially as described.

NOTE: The claims above presented are the same as those which have been erased, except that a new second claim has been added, expressing the radial contraction of the duplicate from the matrix in somewhat broader terms than the former second (present third) claim; the latter claim has been also changed in language so as to more clearly express the invention; the fourteenth (former thirteenth) claim has been amended as the Examiner suggests; and the sixteenth (former fifteenth) claim has been changed to include an obvious omission.

Very respectfully,

THOMAS A. EDISON,

By DYER EDMONDS & DYER,

His Attorneys.

NEW YORK, April 24, 1902.

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UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., May 10, 1902.

This action is taken in view of the amendment filed the 26th ultimo.

The claims appear to be allowable as at present advised and the interference referred to of record will be declared so soon as interferants are prepared for such proceedings.

Action is suspended for fifteen days from date at the expiration of which period of time applicant is requested to call this case up for action.

J. H. L.

J. T. NEWTON EX

HON. COMMISSIONER OF PATENTS,

*Sir:* The Examiner's letter of the 10th instant in the above-entitled application was duly received, further suspending the application for a period of fifteen days for the purpose of interference. We hope that unless the application of the interfering party is promptly placed in acceptable condition, the present application may be allowed. The case has already been involved in three interferences, two of which have been contested to a final hearing. One of applicant's former contestants, Lambert, is at the present time largely engaged in competition with the applicant, so that it is of the highest importance to applicant that his patent should issue. We hope that the Examiner in the further consideration of the case will bear this fact in mind.

Very respectfully,

THOMAS A. EDISON,

By DYER EDMONDS & DYER,

His Attorneys.

NEW YORK, May 21, 1902.



UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., June 24th, 1902.

Your case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before the 15th day of July, 1902, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count 1.

The method of producing hollow cylindrical phonograms, which consists in obtaining a mold having a reverse phonogram record on the inner wall of a cylindrical opening forming a hollow cylindrical plastic phonogram within said mold, releasing the phonogram from the mold by a radial contraction of the phonogram sufficient to entirely clear the surfaces, and removing the phonograms from the mold by direct longitudinal movement.

The foregoing count is your claim 2; claim 1 of an application of Eldridge R. Johnson of Philadelphia, Pa., for Process of Duplicating Sound Records, whose atty. is Horace Pettit, #1012 Stephen Girard Building, Philadelphia, Pa., and claim 9 of an application of Maurice Joyce (Case A) of Washington, D. C., for Duplicating Phonograms, whose atty. is Wallace A. Bartlett, Washington, D. C.

Count 2.

The method of producing hollow cylindrical phonograms which consists in obtaining a mold having a reverse phonogram record on the inner wall of a cylindrical opening, forming a hollow cylindrical plastic phonogram within said mold, releasing the phonogram from the mold by a reduction in temperature sufficient to entirely clear the surface, and removing the phonogram from the mold by direct longitudinal movement.

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The foregoing count is your claim 3; claim 2 of Johnson and claim 5 of Joyce, (Case A.)

Count 3.

The method of producing phonograph cylinders which consists in placing within a hollow cylindrical record mold or matrix, a hollow cylindrical phonograph blank of sufficient thickness to maintain its shape during and after its engagement with the matrix, outwardly expanding such blank against said matrix, disengaging the impressed record cylinder from the matrix, and withdrawing said record cylinder from the matrix by direct longitudinal movement.

The foregoing count is your claim 4; Johnson's claim 3, and claim 1 of an application of Maurice Joyce (Case B) of Washington, D. C., for Duplicating Phonograms, whose atty. is W. A. Bartlett, Washington, D. C.

Count 4.

The method of producing phonograms which consists in placing within a hollow cylindrical record matrix a hollow cylindrical phonograph blank of sufficient thickness to maintain its form under normal conditions, softening said blank by heat and expanding the same while heated so as to take the record from the matrix, shrinking the phonogram so made by change of temperature, and withdrawing the same from the matrix by direct longitudinal movement.

The foregoing count is your claim 5; claim 4 of Johnson and claim 2 of Joyce (Case B)

J. H. L.

J. T. NEWTON EX

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., June 24, 1902.

Your case, above referred to; is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed



up and filed on or before the 15th day of July, 1902, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count 1.

The process of duplicating sound records, which consists in impressing a plastic record tablet against a suitable matrix by its own expansive force.

The foregoing count is your claim 1 and is claim 7 of an application of Maurice Joyce of Washington, D. C., for Duplicating Phonograms, whose atty. is W. A. Bartlett, Loan and Trust Building, Washington, D. C.

Count 2.

The method of producing phonograms which consists in placing within a hollow matrix a hollow body of plastic material, said body being a cylinder on its outer surface and having a tapering central longitudinal aperture, softening said body by heat and expanding it into the matrix by the longitudinal movement of a tapering plunger within the plastic body, shrinking the plastic material and withdrawing it from the matrix by direct longitudinal movement.

The foregoing count is your claim 6 and is claim 5 of Joyce.

Count 3.

The process of duplicating phonograms with a phonographic record thereon, which consists in forming a matrix or mold wherein the original record is reproduced in relief, loosely engaging a phonogram blank with said matrix, then intimately engaging the blank with said matrix or mold by changes of temperature.

The foregoing count is your claim 7 and is claim 8 of Joyce.

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UNITED STATES PATENT OFFICE,

WASHINGTON, D. C., June 24, 1902

Your case, above referred to, is adjudged to interfere with others, hereafter specified, and the question of priority will be determined in conformity with the Rules.

The statement demanded by Rule 110 must be sealed up and filed on or before the 15th day of July, 1902, with the subject of the invention, and name of party filing it, indorsed on the envelope. The subject-matter involved in the interference is

Count 1.

The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the continuous cylindrical blank to be reproduced within said matrix or mold, in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, the cylindrical blank being sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement.

Count 2.

The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram so as to form a matrix or mold, in inserting the blank to be reproduced within said matrix or mold, in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, in finally shrinking the blank to disengage it from the matrix or mold, the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement.

Count 3.

The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in de-



positing a metal on said phonogram to form a matrix or mold where in the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, and in finally subjecting the expanded blank to pressure to more intimately engage it with said record.

## Count 4.

The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, in subjecting the expanded blank to pressure to more intimately engage it with such record, and in finally chilling the blank to remove it from the matrix or mold.

## Count 5.

The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram to form a matrix or mold, in covering said matrix or mold with a metal backing, in introducing the continuous cylindrical phonogram to be reproduced within said matrix or mold, in expanding said phonogram into intimate engagement with the record in relief carried by the bore of said matrix or mold, the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement.

## Count 6.

The method of reproducing phonograms, which consists in securing a hollow metallic mold or shell containing the reverse record, placing in said mold an expansible blank sufficiently thick to maintain its shape during and after its removal from the mold, expanding both by heat, impressing the record in the blank, contracting the phonogram so made by the withdrawal of heat, and removing the phonogram from the mold by a direct longitudinal movement.

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J. H. L.

Thomas A.  
c/o Dy

Sir:—You  
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The method of producing record cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and then outwardly expanding under pressure within the matrix a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder or tube by direct longitudinal movement.

Count 1 is your claim 9 and is claim 5 of an application of Eldridge R. Johnson of Philadelphia, Pa., for Process of Duplicating Sound Records, whose atty. of record is Horace Pettit, #1012 Stephen Girard Building, Philadelphia, Pa.

Count 2 is your claim 10 and claim 6 of Johnson.

Count 3 is your claim 11 and claim 7 of Johnson.

Count 4 is your claim 12 and claim 8 of Johnson.

Count 5 is your claim 13 and is claim 9 of Johnson.

Count 6 is your claim 4 and is claim 10 of Johnson.

Count 7 is your claim 17 and claim 12 of Johnson.

J. H. L.

J. T. NEWTON

*Ex*

U. S. PATENT OFFICE.

Washington, D. C., Oct. 20, 1902

Thomas A. Edison,  
c/o Dyer, Edmonds & Dyer,  
31 Nassau St.,  
New York, N. Y.

Sir:—Your application for a patent for an Improvement in Process of Duplicating Phonographs Filed Mar. 5, 1898, has been examined and allowed.

Respectfully,

F. I. ALLEN,  
*Commissioner of Patents.*





1

Northern District of Illinois—

Hearing, July 1,  
1904.

Northern Division.

National Phonograph Company, }  
vs. } 26,598.  
Lambert Company, }

Be it remembered that on this day to-wit: the first day of July, 1904, being one of the days of the regular December term of said Court, 1903, in the record of proceedings thereof in said entitled cause before the Hon. Christian C. Kohlsaat, District Judge, appears the following entry to-wit:

ORDER OF JULY 1, 1904, CAUSE TAKEN UNDER

## ADVISEMENT.

The National Phonograph Company }  
vs. } 26,598.  
Lambert Company, }

Now come the parties by their solicitors, and thereupon, this cause is set down for final hearing on the pleadings and proofs and the Court having heard the same and not being sufficiently advised in the premises takes time to consider.

2 And on to-wit the 17th day of August,, 1904, there was filed in the clerk's office of said Court in said cause entitled a certain Opinion in words and figures following to-wit:



Opinion, filed Aug.  
17, 1904.

## OPINION.

IN THE

CIRCUIT COURT OF THE UNITED STATES,

For the Northern District of Illinois,

National Phonograph Co. }  
vs. } 26,598  
Lambert Co. }

Kohlsaat, J.

The bill herein was filed to restrain infringement of patent No. 713,209, granted to Thomas A. Edison, Nov. 11, 1902, for processes for Duplicating Phonograms, Only the 2nd, 3rd, 4th, 5th, 9th, 10th and 17th claims are actually involved. On October 26, 1888, complainant filed in the patent office a caveat, for a process of forming duplicate phonograms by forcing material made plastic by heat, against a matrix formed upon the inside surface of a circular die and then permitting it to cool.

The caveat asserts that the phonogram "will contract sufficiently away from the record to allow of its being taken out."

From October 26, 1888, to March 5, 1898, the date of the application, no steps were taken by the patentee to secure the patent covering the matters set out in the caveat. From the testimony of Mr. Edison it appears that during that period of ten years the process was in use in Edison's factory. A great many copies of records made from matrices were placed upon the market. Edison used only such materials as required the employment of a mandril in expanding or forcing the material into the matrix.

The record disclosed the fact that no particular effort was made to maintain secrecy among the employees in regard to the process. The fact that the phonograms were placed upon the market in great numbers is satisfactory evidence that the process was a commercial success. Mr. Edison himself says:— Answer to Question 18—the process was, in a broad sense, just the same in 1888 as now.

In the mean time defendant had perfected his celluloid methods and processes and made a successful commercial product.

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Complainant about July 1, 1902, claim to use the process (X.Q. 110) at which time Edison says (X.Q. 109) mechanical duplicates were abandoned. Opinion, filed Aug. 17, 1904.

It is to restrain defendant from manufacturing these mechanical duplicates that complainant seeks to invoke the power of the Court in support of its alleged rights under the caveat. No reason is disclosed why ten years delay should have followed the filing of the caveat. In an age when science is making rapid progress one may not lie still and see advances made even along lines suggested by him and then after years of forward movement assert his prior claim to the broad invention. Complainant and its grantors have slept in their rights. To hold otherwise would be unjust to defendant and others who have developed the art.

The bill is dismissed for want of equity.

(Endorsed) Filed August 17, 1904, Marshall E. Sampsell, Clerk.

4 And on the same day to-wit: the 17th day of August, being one of the days of the regular July term of said Court, 1904, in the record of proceedings thereof in said entitled cause before the Hon. Christian C. Kohlsaat, District Judge, appears the following entry to-wit: Decree, Aug. 17, 1904.

#### DECREE OF DISMISSAL OF AUGUST 17, 1904.

National Phonograph Company, }  
   vs.   } 26,598.  
   Lambert Company,

The Court having considered and being now fully advised in the premises finds that the bill herein is without equity and should be dismissed.

It is thereupon Ordered, Adjudged and Decreed that the bill of complaint herein be, and the same is hereby dismissed for want of equity at the costs of the complainant, and that the defendant have execution therefor.

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Petition for appeal, filed Jan. 4, 1905.

5 And on to-wit the fourth day of January, 1905, came the National Phonograph Company by its solicitor, Mr. Philip C. Dyrenforth and its counsel Mr. Richard N. Dyer and filed in the clerk's office of said court its certain petition for appeal in words and figures following to-wit:

# PETITION FOR APPEAL.

UNITED STATES CIRCUIT COURT

In and for the Northern District of Illinois—

Northern Division.

National Phonograph Company,	} In Equity.
<i>Complainant</i>	
<i>vs.</i>	
Lambert Company,	
<i>Defendant,</i>	

The above named complainant, National Phonograph Company, conceiving itself aggrieved by the final decree dismissing the bill of complaint herein, made and entered on the 17th day of August, 1904, in the above entitled case, does hereby appeal from said decree to the United States Circuit Court of Appeals for the Seventh Circuit for the reasons specified in the Assignment of Errors, which is filed herewith, and prays that this appeal may be allowed, and a citation granted, directed to the above-named defendant, commanding it to appear before the United States Circuit Court of Appeals, for the Seventh Judicial Circuit, to do and receive what may appertain to justice to be done in the premises.

6 and that a transcript of the record, proceedings and papers upon which said decree was made may be duly authenticated and sent to the United States Circuit Court of Appeals for the Seventh Judicial Circuit.

NATIONAL PHONOGRAPH COMPANY,  
By PHILIP C. DYRENFORTH,  
*Solicitor for Complainant.*

RICHARD N. DYER,  
*Of counsel.*

(Endorsed) Filed Jan., 4, 1905, Marshall E. Sampson,  
Clerk.

And on the 1905, came the tors and filed titled cause figures follow

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And on the same day to-wit: the fourth day of January, 1905, came the National Phonograph Company by its solicitors and filed in the clerk's office of said Court in said entitled cause its certain assignment of errors in words and figures following to-wit:

Assignment of errors, filed Jan 4, 1905.

ASSIGNMENT OF ERRORS.

UNITED STATES CIRCUIT COURT,

In and for the Northern District of Illinois,

Northern Division.

National Phonograph Company,  
Complainant,  
vs.  
Lambert Company,  
Defendant, } In Equity.

Now comes the complainant, National Phonograph Company by its solicitors, and says that in the record and proceedings of the United States Circuit Court for the Northern District of Illinois, Northern Division, in the above entitled cause, and in the decree made upon the 17th day of 7 August, 1904, there is manifest error, and for such error the complainant assigns the following:

First. The Court erred in holding that the invention described and claimed in Letters Patent No. 713,209, being the patent in suit, had been in public use for more than two years prior to the date of application for said patent.

Second: The Court erred in holding that the complainant's assignor was guilty of laches in making application for the grant of said Letters Patent No. 713,209.

Third: The Court erred in holding the patent in suit invalid because Edison more than two years before the application for said patent, disclosed the invention described and claimed therein to certain of his employees, and made no effort to maintain secrecy in regard thereto.

Fourth: The Court erred in holding that the defendant had perfected methods and process of making celluloid phonograph records as covered by complainant's Letters Patent



Assignment of  
errors, filed Jan.  
4, 1905.

in suit prior to the filing of the application for said Letters Patent.

Fifth: The Court erred in holding that the defendant and others had developed the art to which the Letters Patent involved in the suit relate prior to the filing of the application for that patent.

Sixth: The Court erred in dismissing the bill of complaint.

Dated December 31, 1904.

PHILIP C. DYRENFORTH,  
*Solicitor for Complainant.*

RICHARD N. DYER,  
*Of counsel.*

(Endorsed) Filed Jan., 4, 1905, Marshall E. Sampsell,  
Clerk.

Order of Jan. 4,  
1905.

8 And on the same day to-wit: the fourth day of January, 1905, being one of the days of the regular December term of said Court, 1904, in the record of proceedings thereof in said entitled cause before the Hon. Christian C. Kohlsaat, District Judge appears the following entry to-wit:

ORDER OF JANUARY 4, 1905, APPEAL ALLOWED  
UPON FILING BOND.

National Phonograph Company, }  
vs. } 26,598  
Lambert Company,

The petition of the complainant above named praying an appeal is granted, conditioned on the filing by said complainant of an appeal bond in the sum of five hundred dollars (\$500.00) with surety to be approved by the Court.

9 And on to-wit: the 12th day of January, 1905, being one of the days of the regular December term of said Court, 1904, in the record of proceedings thereof in said entitled cause before the Hon. Christian C. Kohlsaat, District Judge, appears the following entry to-wit:

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ORDER OF JANUARY 12, 1905, ALLOWING APPEAL  
AND APPROVING BOND.

Order of Jan. 12,  
1905, allowing  
appeal.

National Phonograph Company, }  
vs. } 26,598  
Lambert Company,

Now again comes the complainant by its solicitor and presents its appeal bond in the penalty of five hundred dollars, with the National Surety Company as surety, which the Court approves, and directs the same to be filed.

And it appearing that said complainant has now fully complied with the rules of the United States Circuit Court of Appeals for this Circuit, and the order entered herein on the fourth day of January, 1905, allowing said appeal conditional upon filing an appeal bond in the sum of five hundred dollars,

It is Ordered that said appeal be and the same is hereby made absolute.

And on the same day to-wit: the 12th day of January, 1905, there was filed in the clerk's office of said Court in said entitled cause a certain Bond in words and figures following to-wit:

Bond on appeal,  
filed Jan. 12,  
1905.

10 Know all Men by these Presents, That we, National Phonograph Co., as principal, and National Surety Company, as sureties, are held and firmly bound unto Lambert Company, in the full and just sum of Five Hundred Dollars, to be paid to the said Lambert Company, its certain attorney, executors, administrators, or assigns; to which payment, well and truly to be made, we bind ourselves, our heirs, executors and administrators, jointly and severally, by these presents. Sealed with our seals and dated this 5th day of January in the year of our Lord one thousand nine hundred and five.

Whereas, lately at a session of the Circuit Court of the United States, for the Northern District of Illinois, in a suit depending in said Court, between said National Phonograph Company as complainant and said Lambert Company as defendant, a decree was rendered against the said National Phonograph Company, and the said National Phonograph Company having prayed an appeal to the United States Cir-



Bond on appeal,  
filed Jan. 12,  
1905.

cuit Court of Appeals for the Seventh Circuit, and having obtained the same and filed a copy thereof in the Clerk's Office of the said Court to reverse the decree in the aforesaid suit, and a citation directed to the said defendant, citing and admonishing it to be and appear at a United States Circuit Court of Appeals, for the Seventh Circuit, to be holden at Chicago within 30 days from the date hereof.

Now, the condition of the above obligation is such, That if the said National Phonograph Co. shall prosecute the said appeal to effect, and answer all damages and costs if it fail to make its plea good, then the above obligation to be void; else to remain in full force and virtue.

NATIONAL SURETY COMPANY,  
WILLIAM A. VINCENT,  
*Resident Vice President.*  
CHARLES S. CRAIN,  
*Resident Assistant Secretary.*

(Seal)

NATIONAL PHONOGRAPH COMPANY,  
By J. F. RANDOLPH,  
*Secretary and Treasurer.*

(Seal)

Sealed and delivered in the presence of—

J. L. McKENNA,  
GEO. S. LORD,  
GEORGE A. MEISTER,  
Approved Jan., 12, 1905,

KOHLSAAT,  
J.

(Endorsed) Filed Jan., 12, 1905, Marshall E. Sampsell,  
Clerk.

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Chicago, Jan

(Endorsed)  
Clerk.

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Y COMPANY,  
M. A. VINCENT  
Vice President  
R. S. CHAIN,  
Assistant Secretary  
H COMPANY,  
F. RANDOLPH  
y and Treasurer

11 And on to-wit: the 5th day of January, 1905, there was  
filed in the clerk's office of said court in said entitled  
cause a certain stipulation in words and figures following  
to-wit:

Stipulation, filed  
Jan. 5, 1905.

STIPULATION.

UNITED STATES CIRCUIT COURT,

Northern District of Illinois—

Northern Division.

National Phonograph Company, } In Equity.  
vs. } No. 26,598.  
Lambert Company,

Stipulation.

It is hereby stipulated by the parties hereto, represented by  
their solicitors, that the printed copies of the record filed  
by the complainant and defendant on the final hearing of  
this cause are true and correct copies of the complainant's  
and defendant's pleadings and proofs, and may be used as  
such by the clerk of the court in making a transcript of the  
record on appeal; also that twenty-five or more of said  
printed copies shall be delivered to the clerk of the United  
States Circuit Court of Appeals, to be used in making up  
the printed copies of the transcript.

PHILIP C. DYRENFORTH,  
Solicitor for Complainant.  
THOMAS F. SHERIDAN,  
Solicitor for Defendant.

Chicago, Jan. 5, 1905.

(Endorsed) Filed Jan. 5, 1905, Marshall E. Sampsell,  
Clerk.

KOHLISAAT,

all E. Sampsell









729 No. 713,209.

Patented Nov. 11, 1902.

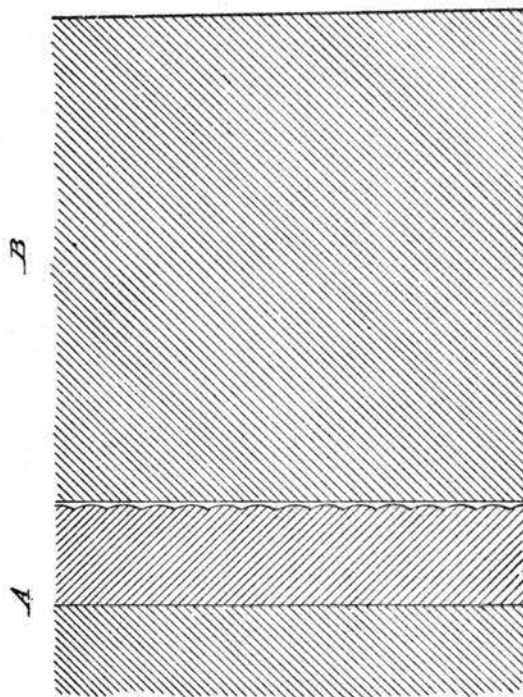
T. A. EDISON.  
PROCESS OF DUPLICATING PHONOGRAMS.

(Application filed Mar. 5, 1898.)

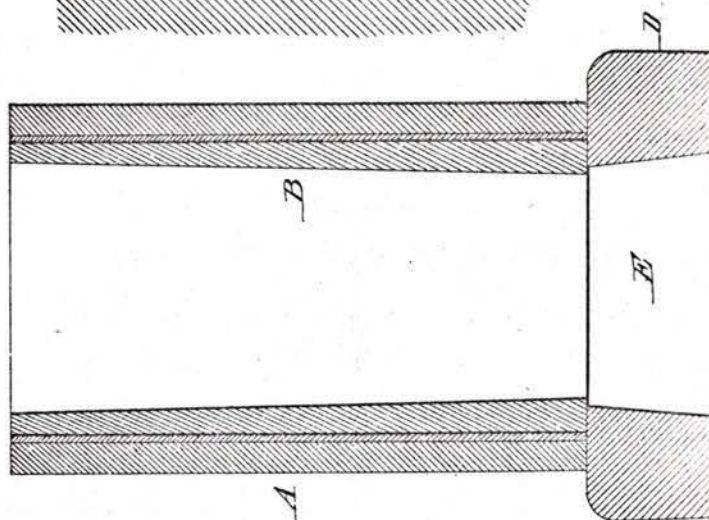
(No Model.)

3 Sheets—Sheet 1

*Fig. 1<sup>a</sup>*



*Fig. 1*



Witnesses:

*Jas. F. Coleman*

*Geo. Robt Taylor*

Inventor

*Thomas A Edison*

*By Alex Edmunds atty.*

Att'y





No. 713,209.

Patented Nov. 11, 1902.

T. A. EDISON.  
PROCESS OF DUPLICATING PHONOGRAMS.

(Application filed Mar. 5, 1898.)

(No Model.)

3 Sheets—Sheet 2.

Fig. 2<sup>e</sup>

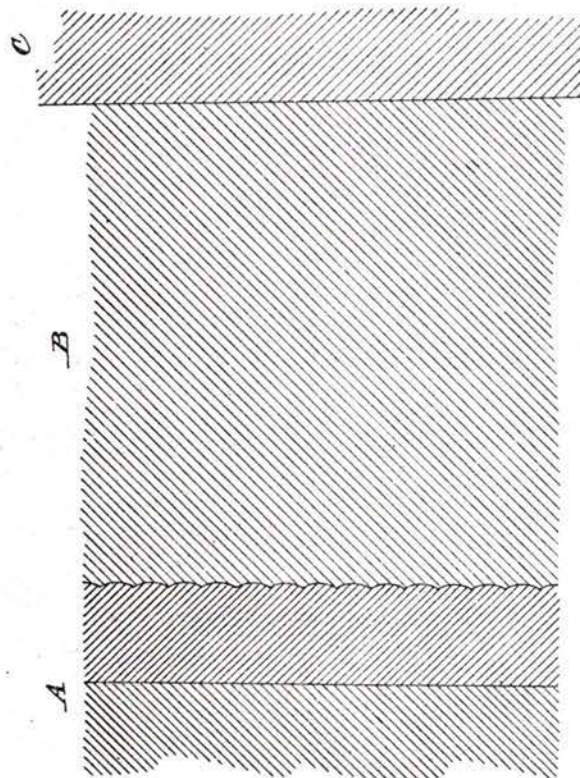
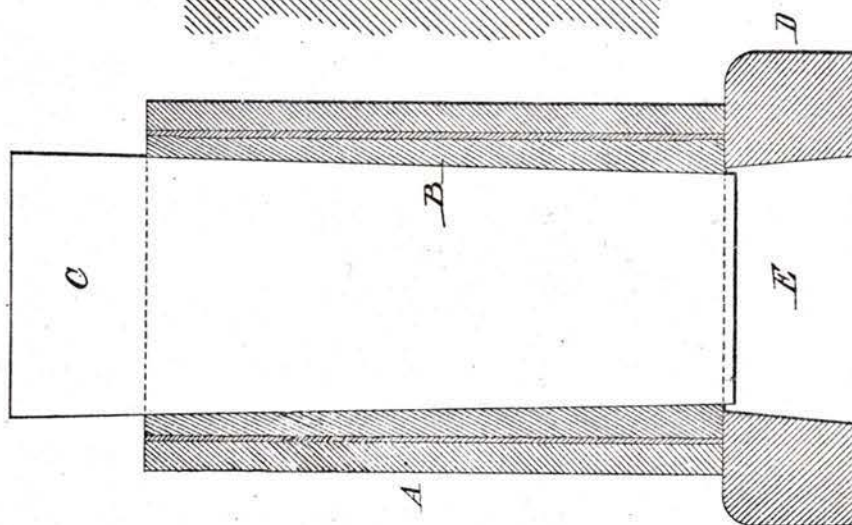


Fig. 2



Witnesses:

Geo. F. Coleman  
Geo. Robt Taylor

Inventor

Thomas A. Edison  
by *Alfred Edmund Storer*  
Att'ys.





731 No. 713,209.

T. A. EDISON.  
PROCESS OF DUPLICATING PHONOGRAMS.  
(Application filed Mar. 5, 1898.)

Patented Nov. 11, 1902.

(No Model.)

3 Sheets—Sheet 3.

Fig. 3<sup>a</sup>

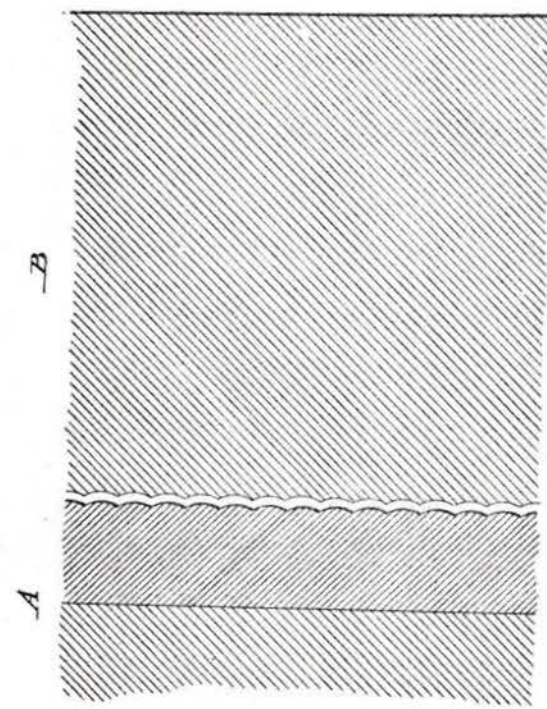
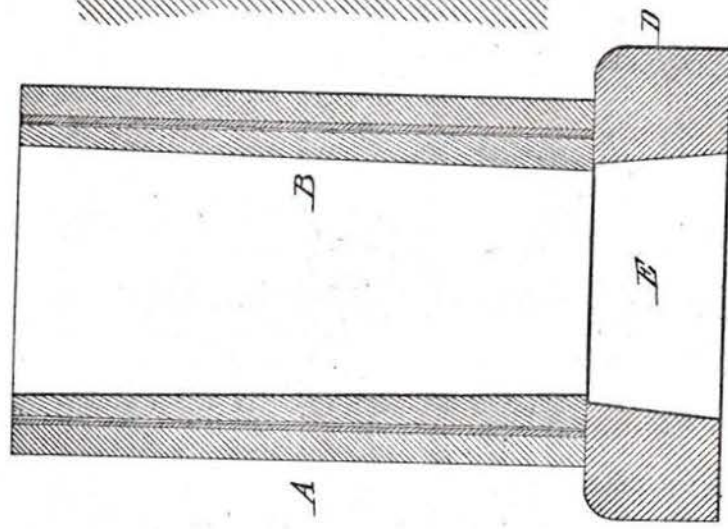


Fig. 3



Witnesses:

Jas. F. Coleman  
Geo. Robt Taylor

Inventor

Thomas A. Edison  
by Ayer Edmunds & Ayer  
Att'ys.

SPECIFI

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## UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

## PROCESS OF DUPLICATING PHONOGRAMS.

SPECIFICATION forming part of Letters Patent No. 713,209, dated November 11, 1902.

Application filed March 5, 1898. Serial No. 372,650. (No specimens.)

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Processes of Duplicating Phonograms, (Case No. 994,) of which the following is a specification.

The object I have in view is to produce a practical process for the duplication of phonographic records, whereby a practically unlimited number of duplicate phonographic records may be obtained which will be absolutely identical in every respect with the original record. Generally I propose to construct a suitable matrix, preferably in metal, and by its use to impress duplicate phonograms with a phonographic record thereon, such phonograms being preferably constructed of a material having a greater coefficient of expansion than the material of the matrix or mold.

By my process the duplicate phonogram or the surface thereof may be and preferably is constructed of a material too hard for the satisfactory cutting of an original record therein by the usual phonographic recorder, whereby the duplicate phonograms may be made more durable than it is possible to make original records; but the duplicate phonograms may obviously be made of a softer material.

My improved process can be carried out for the reproduction of phonographic records of any desired form, either flat disks or hollow cylinders; but it has been specially devised for use in connection with the duplication of records of the latter type. For the duplication of cylindrical phonographic records from a tubular matrix my improved process also provides for the effective removal of the finished duplicate from the matrix without injury to the record-surface of the former.

In carrying my process into effect I first construct a matrix carrying a negative representation of the record, which matrix can be produced by any of the known processes—as, for example, those indicated in my Patent No. 484,582, dated October 18, 1892. As I explained in this patent, an original phonographic record having a surface of the usual wax-like material is first secured and its sur-

face coated with a coating of conducting material in order to permit the original record to be electroplated. This conducting coating can be and preferably is applied by a process of vacuous deposit, as I described in my Patent No. 527,147, dated September 18, 1894, by placing the record in a vacuum-chamber in which a metal is vaporized by an electric arc produced between electrodes of the metal, the metallic vapor depositing as a thin uniform coating on the original record. I prefer to apply a preliminary coating: by a process of vacuous deposit, for the reason that the highly-comminuted condition of the vaporized metal permits the coating to form as a uniform film, following accurately all the variations of the record, however minute. Instead of coating the original record with a vaporized metal it may be coated with a very thin layer of specially-prepared plumbago of exceedingly-great fineness, or instead thereof gold-leaf or silver salts reduced by chemical reagents to the metallic state may be used for the same purpose. Having thus applied a very thin preliminary coating to the original record, the latter is immersed in an electroplating bath and electroplated with a metal to the desired thickness, thereby forming a shell inclosing the original record, which shell carries on its bore an accurate negative representation of that record. Preferably this shell is suitably incased in a close-fitting cylindrical jacket, although if the electroplating is carried on long enough to form an electroplated coating of sufficient thickness a jacket need not be used. The original record is removed from the electroplated matrix obtained as described either before or after the jacket, if used, is applied to the shell. This removal of the original record can be effected either by dissolving or melting the wax-like material or by contracting the original record radially and removing it by a direct longitudinal movement. In the case of cylindrical phonographic records the resulting matrix will be a hollow metal cylinder or tube or one internally faced with metal carrying the phonographic record in relief upon its inner surface.

While I have indicated convenient and well-known methods for producing the ma-

Inventor

Edison

J. H. Brown

Att'ys.



trix, it will be obvious that the matrix can be obtained in any other way familiar to those skilled in the art.

Having obtained a suitable matrix carrying  
 5 a negative representation of the original phonographic record to be duplicated, I proceed with the duplication of the records as follows: The blanks which are to receive the duplicate records are preferably composed of a material having a higher coefficient of expansion than that of the matrix or mold, and said blanks are made sufficiently thick to maintain their shape during and after the act of disengagement from the matrix, as will be  
 10 explained. The blank under normal temperatures is of a diameter very slightly less than the bore of the matrix or mold, whereby the blank may be inserted in the same. After the blank has been thus placed within the  
 20 matrix or mold both the matrix and the blank contained therein are, or the blank alone is, brought to a higher temperature, whereby the blank will expand and will be brought into intimate contact with the record-surface of  
 25 the matrix or mold, whereby the negative record thereof will be impressed with absolute accuracy upon the surface of the blank. The expansion of the blank into this intimate engagement with the interior of the  
 30 matrix or mold may be effected in any suitable way, such as by maintaining the matrix or mold, with the blank contained therein, in a heated atmosphere. By making the blank of a material having a higher coefficient of  
 35 expansion than the matrix or mold the blank will be properly expanded to receive the impression of the record, notwithstanding the fact that both the blank and the matrix or mold may be subjected to the same temperature.

In order to facilitate the operation and make the resulting duplicate record somewhat sharper, I prefer to introduce a tapering mandrel within the blank after the blank  
 45 has been placed in the matrix or mold and heat applied to the blank, as explained, and to force the mandrel tightly within the blank after the latter has been expanded into engagement with the record, whereby the blank  
 50 will be further expanded mechanically into absolute intimacy with the record, after which the mandrel will be immediately withdrawn. With blanks made of sufficiently viscous material the entire expansion may be effected  
 55 mechanically by forcing a tapering mandrel within the same.

After the blank has been expanded, so as to receive the impression of the matrix or mold, it is removed by first shrinking it radially in any suitable way, as in a refrigerating-chamber, and by then withdrawing the resulting duplicate record by a direct longitudinal movement. Owing to the shallowness of the phonographic-record groove this radial  
 65 shrinkage of the duplicate record effects a sufficient separation of the surfaces of the

matrix and of the duplicate record to prevent injury to the surface of the duplicate record due to any longitudinal contraction thereof.

I find that by the process above described, and particularly when a matrix or mold is obtained by a process of vacuum deposit, as explained, duplicate phonographic records can be obtained which will be accurate reproductions of the original records and be free from extraneous noises and wherein the quality and intensity of the original vibrations will be reproduced with absolute faithfulness. I find, moreover, that since by this process there is little or no wear upon the matrix or mold a practically unlimited number of duplicates may be obtained from a single matrix or mold.

The degree of heat necessary to properly expand the blank will depend largely upon the material of which the blank is formed and upon the closeness of fit of the blank when inserted within the matrix or mold. For the same reasons the extent of the reduction of temperature in chilling and shrinking the duplicate record will vary to a considerable extent.

The invention is illustrated in the accompanying drawings for convenience in connection with a cylindrical phonogram.

In the drawings, Figure 1 is a sectional view showing a matrix or mold with a blank introduced therein prior to the expansion of the blank into engagement with the record-surface of the matrix; Fig. 1<sup>a</sup>, a section through a part of the walls of the blank and matrix very greatly enlarged; Fig. 2, a view similar to Fig. 1, showing the blank expanded into engagement with the matrix and illustrating also a tapered mandrel forced into the blank; Fig. 2<sup>a</sup>, a view corresponding to Fig. 1<sup>a</sup>, showing a part of the walls of the matrix, blank, and mandrel of Fig. 2, very greatly enlarged; Fig. 3, a view corresponding to Figs. 1 and 2 with the tapered mandrel removed and illustrating the formed duplicate as having been contracted radially preparatory to being removed from the blank by a direct longitudinal movement; and Fig. 3<sup>a</sup>, a section, very greatly enlarged, corresponding to Figs. 1<sup>a</sup> and 2<sup>a</sup> and illustrating the relative relation between the duplicate and matrix prior to the removal of the former.

In the views corresponding parts are represented by the same letters of reference.

A represents the matrix or mold, carrying on its bore a negative representation of the record to be reproduced.

B represents the blank to be duplicated, which is preferably provided with a tapered bore, as is now common, and which is of sufficient thickness to maintain its shape during and after the act of disengagement from the matrix. This blank is turned down so that it may be inserted within the matrix or mold with a close fit, as shown in Figs. 1 and 1<sup>a</sup>. The blank to be duplicated may be and prefer-

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ig. 1<sup>a</sup>, a section of the blank and ed; Fig. 2, a view e blank expanded matrix and illus- ndrel forced into 100  
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ably is of a harder material than can be prac- tically or satisfactorily engraved, indented, or cut by a phonographic recorder, whereby the duplicate phonographic records will be more durable than could be obtained in the first instance by the operation of a recording or indenting device actuated directly by the sound-waves. These blanks may therefore be made of a relatively hard material, such as asphalt, or of stearic acid or stearate of soda mixed with varying proportions of fine precipitates—such as chalk, slaked lime, or lamp-black—or waxes or resins may be used, such as sealing-wax or shellac mixed with fine precipitates, like chalk, or polished ebonite, vulcanized hard rubber, or celluloid may be used, or glue may be employed either alone or mixed with precipitates, such as chalk.

C, Figs. 2 and 2<sup>a</sup>, represents a tapered mandrel, which may be inserted within the blank B.

D represents a support for the matrix or mold and for the blank within the same, said support having an opening E therein, whereby the mandrel C may be moved longitudinally within the blank.

In carrying out the process I first introduce the blank within the matrix with as close a fit as practical, as shown in Figs. 1 and 1<sup>a</sup>, after which the mandrel C is inserted within the blank. These parts are then subjected to heat, such as by being maintained in a heated atmosphere, whereby the blank will, by reason of its greater coefficient of expansion than the matrix or mold, be expanded into intimate contact with the record-surface of the latter, and an impression of such record will be accurately received on the blank. When the blank has been thus expanded into engagement with the matrix or mold, the mandrel C is forced tightly within the blank, so as to further expand it mechanically, whereby the blank will be forced into absolute intimacy with the record, and an impression will be received on the blank which will be clear, sharp, and an absolutely faithful reproduction of the original record. After the mandrel has been forced within the blank it is immediately withdrawn, and the blank is then chilled in any suitable way, such as by placing the matrix, with the blank contained therein, in a refrigerating-chamber. In this way the blank or duplicate will shrink or contract radially, as shown in Figs. 3 and 3<sup>a</sup>, sufficiently to be removed from the matrix or mold by a direct longitudinal movement. Owing to the extreme shallowness of the phonographic-record groove, a sufficient radial separation between the resulting duplicate and the matrix or mold will take place to prevent any longitudinal contraction of the duplicate from injuring the record-surface thereof.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. The process of duplicating sound-record-

nat consists in impressing a plastic record-tablet against a suitable matrix by its own expansive force.

2. The method of producing hollow cylindrical phonograms, which consists in obtain- 70  
ing a mold having a reverse phonogram-rec- ord on the inner wall of a cylindrical open- ing, forming a hollow cylindrical plastic phonogram within said mold, releasing the 75  
phonogram from the mold by a radial contraction of the phonogram sufficient to entirely clear the surfaces, and removing the phonogram from the mold by direct longitudinal movement. 80

3. The method of producing hollow cylindrical phonograms which consists in obtain- ing a mold having a reverse phonogram-rec- ord on the inner wall of a cylindrical opening, forming a hollow cylindrical plastic phono- 85  
gram within said mold, releasing the phono- gram from the mold by a reduction in temperature sufficient to entirely clear the surfaces, and removing the phonogram from the mold by direct longitudinal movement. 90

4. The method of producing phonograph- cylinders which consists in placing within a hollow cylindrical record mold or matrix, a hollow cylindrical phonograph-blank of sufficient thickness to maintain its shape during 95  
and after its engagement with the matrix, outwardly expanding such blank against said matrix, disengaging the impressed record-cylinder from the matrix, and withdrawing said record-cylinder from the matrix by direct longitudinal movement. 100

5. The method of producing phonograms which consists in placing within a hollow cylindrical record-matrix a hollow cylindrical phonograph-blank of sufficient thickness to maintain its form under normal conditions, softening said blank by heat and expanding the same while heated so as to take the record from the matrix, shrinking the phonogram so made by change of temperature, and with- 110  
drawing the same from the matrix by direct longitudinal movement.

6. The method of producing phonograms which consists in placing within a hollow matrix a hollow body of plastic material, said 115  
body being a cylinder on its outer surface and having a tapering central longitudinal aperture, softening said body by heat and expanding it into the matrix by the longitudinal movement of a tapering plunger within the plastic body, shrinking the plastic material and withdrawing it from the matrix by direct longitudinal movement. 120

7. The process of duplicating phonograms having a phonographic record thereon, which consists in forming a matrix or mold wherein the original record will be reproduced in relief, in loosely engaging a blank phonogram with said matrix, and in finally intimately en- 125  
gaging the blank phonogram with said matrix or mold by changes in temperature, substantially as set forth. 130



8. The process of duplicating phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, and in intimately engaging a blank phonogram with the said matrix or mold by a change in temperature, substantially as set forth.

9. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the continuous cylindrical blank to be reproduced within said matrix or mold, in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, the cylindrical blank being sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth.

10. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram so as to form a matrix or mold, in inserting the blank to be reproduced within said matrix or mold, in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, in finally shrinking the blank to disengage it from the matrix or mold, the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth.

11. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, and in finally subjecting the expanded blank to pressure to more intimately engage it with said record, substantially as set forth.

12. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal on said phonogram to form a matrix or mold wherein the original record will be reproduced in relief, in inserting the blank to be reproduced within said matrix or mold, in heating the blank, whereby the same will be expanded into engagement with the record in relief carried by the bore of said matrix or mold, in subjecting the expanded blank to pressure to more intimately engage it with such record, and in finally chilling the blank to re-

move it from the matrix or mold, substantially as set forth.

13. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram to form a matrix or mold, in covering said matrix or mold with a metal backing, in introducing the continuous cylindrical phonogram to be reproduced within said matrix or mold, in expanding said phonogram into intimate engagement with the record in relief carried by the bore of said matrix or mold, the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth.

14. The method of producing phonograms, which consists in securing a hollow metallic mold or shell containing the reverse record, placing in said mold an expansible blank sufficiently thick to maintain its shape during and after its removal from the mold, expanding both by heat, impressing the record in the blank, contracting the phonogram so made by the withdrawal of heat, and removing the phonogram from the mold by a direct longitudinal movement, substantially as set forth.

15. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing a metal upon the original phonogram so as to form a matrix or mold, in inserting within said matrix or mold a blank to be reproduced made of a material having a higher coefficient of expansion than said matrix or mold, and in heating the blank and matrix carried thereby, whereby the blank will be expanded into intimate engagement with the record in relief carried by the bore of said matrix or mold, substantially as set forth.

16. The process of duplicating cylindrical phonograms having a phonographic record thereon, which consists in depositing in a vacuum a metal vapor upon the original phonogram, electroplating a metal thereon so as to form a matrix or mold, in inserting the continuous cylindrical blank to be reproduced within said matrix or mold, in expanding the blank into intimate engagement with the record in relief carried by the bore of said matrix or mold, the cylindrical blank being made sufficiently thick to maintain its shape during and after the act of disengagement from the matrix, and finally removing the cylinder by direct longitudinal movement, substantially as set forth.

17. The method of producing record-cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and then outwardly

expanding a cylinder sufficiently thin and after a matrix, and tube by direct longitudinal movement, substantially as set forth.

18. The method of producing sound-cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively soft material, rendering the surface of the wax cylinder electrically conductive, and electrolytically depositing metal thereon forming a matrix, and then outwardly



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a cylinder or tube of softened material suffi-  
ciently thick to maintain its shape during  
and after the act of disengagement from the  
matrix, and finally removing the cylinder or  
tube by direct longitudinal movement.

18. The herein-described process of mold-  
ing sound-records in celluloid, which consists  
of softening a celluloid tablet and then fore-

ing the same against a suitable matrix by its  
own expansive force, substantially as de-  
scribed.

This specification signed and witnessed this  
21st day of February, 1898.

THOMAS A. EDISON.

Witnesses:-

J. F. RANDOLPH,  
RICHD. N. DYER.









740 (No Model.)

T. A. EDISON.  
PHONOGRAM BLANK.

No. 382,418.

Patented May 8, 1888.

FIG. 1.

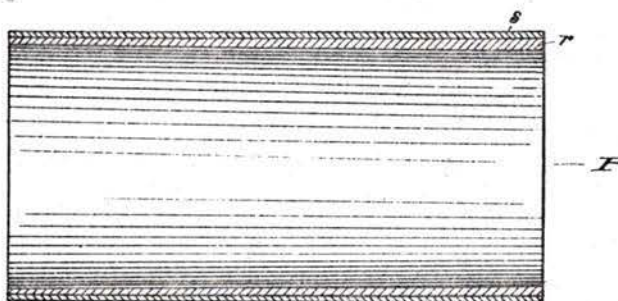
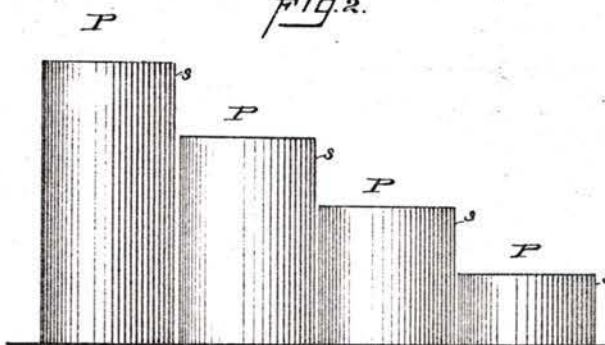


FIG. 2.



Witnesses  
E. J. Townsend  
William A. Ayer

Inventor.  
Thomas A. Edison  
By his Attorneys Dyer & Schick

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# UNITED STATES PATENT OFFICE.

May 8, 1888.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

## PHONOGRAM-BLANK.

SPECIFICATION forming part of Letters Patent No. 382,418, dated May 8, 1888.

Original application filed November 26, 1887 Serial No. 256,189. Divided and this application filed March 2, 1888. Serial-No. 265,689. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonogram-Blanks and Phonograms, (Case No. 762, division of Case No. 741,) of which the following is a specification.

The object I have in view is to produce a cylindrical phonogram blank or phonogram which can be readily placed upon the phonogram-cylinder of a phonograph, and will center itself, and will also be adapted to retain its place upon the phonogram-cylinder by friction alone. This I accomplish by providing the cylindrical phonogram blank or phonogram with a tapering bore adapted to fit over a similarly-tapered phonogram-cylinder. The phonogram-blank or phonogram is provided with a cylindrical recording-surface. Blanks or phonograms of the full length of the tapering phonogram-cylinder of the phonograph can be used as well as those of shorter length, the tapering bore centering the blank or phonogram, and adapting it to be pushed onto the phonogram-cylinder until it binds thereon with sufficient friction to hold it in place.

In the accompanying drawings, forming a part hereof, Figure 1 is a sectional view of a phonogram-blank or phonogram, showing by dotted lines its division into sections; and Fig. 2 an elevation, showing four different sizes of the phonogram-blank or phonogram.

P represents phonogram-blanks or phonograms. They have a cylindrical recording-surface, *s*, made of wax, or a wax-like substance, which may be mounted upon a backing, *r*, which is also a cylinder, but has a tapering bore adapted to fit upon a similarly-tapered phonogram-cylinder of a phonograph.

I propose to make these phonogram-blanks the entire length of the phonogram-cylinder, and also to divide such full-length phonogram-blanks into parts, so that sectional phonogram-blanks will be produced, which will be, for illustration, one-fourth, one-half, and three-fourths the length of the full-size phonogram blanks. All of these sectional phonogram blanks, as well as the full-sized phonogram-blank, will have the tapering bore, so that they can be pushed upon the tapering phonogram-cylinder until they bind, and the instrument can then be adjusted to them for recording and reproducing.

I do not claim herein a phonogram-blank having a recording surface of wax, or a wax-like material, nor such a surface mounted upon backing of tougher material, such matters being covered by my application for patent, (Case No. 734, Serial No. 252,964,) filed October 21, 1887.

What I claim is—

1. A phonogram-blank or phonogram having a bore tapered throughout its length, substantially as set forth.

2. A phonogram blank or phonogram having a cylindrical recording-surface and a tapering bore, substantially as set forth.

3. A phonogram-blank or phonogram having a cylindrical recording-surface of wax or wax-like material and provided with a tapering bore, substantially as set forth.

This specification signed and witnessed this 20th day of February, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,  
E. C. ROWLAND,

Inventor.

A. Edison

Dyer & Seely









746

(No Model.)

T. A. EDISON.

PROCESS OF DUPLICATING PHONOGRAMS.

No. 382,419.

Patented May 8, 1888.

Fig. 1.

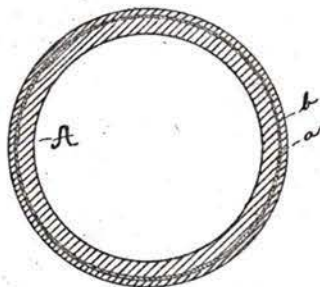


Fig. 2.

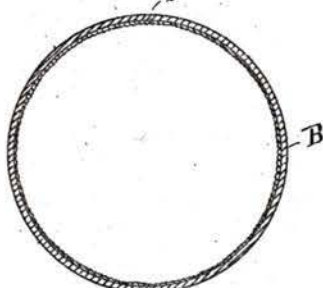


Fig. 3.

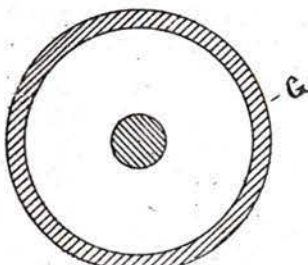
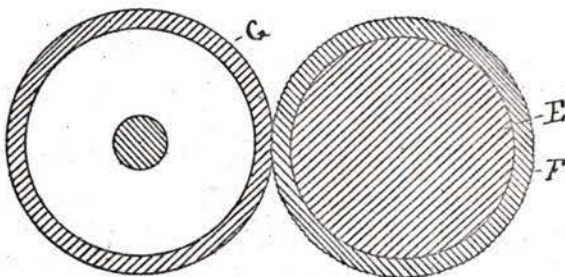


Fig. 4.



Witnesses  
E. C. Howland  
William Rizer

Inventor  
Thomas A. Edison  
By his Attorneys

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S.  
May 8, 1888.

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

## PROCESS OF DUPLICATING PHONOGRAMS.

SPECIFICATION forming part of Letters Patent No. 382,419, dated May 8, 1888.

Application filed March 8, 1888. Serial No. 266,596. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Processes for Duplicating Phonograms, (Case No. 765,) of which the following is a specification.

The object of my invention is to produce a simple and efficient process for duplicating phonographic records. In applications already filed by me I describe a process for duplicating phonograms, wherein a metallic matrix is formed by depositing metals over the surface of cylindrical wax phonograms and then dissolving out the wax, leaving a hollow matrix or mold with the record in relief upon its inner surface. By my present invention I propose to apply the process of knurling to the duplication of phonograms as distinguished from molding. In my English Patent No. 1,644 of 1878 I proposed to construct a knurl by depositing metal over the record; but it is obvious that if this deposit were made of any thickness at all the record would be largely obliterated.

By my present invention I deposit metals over the record of the recording surface of a cylindrical wax phonogram, and after melting out the original wax I divide the remaining cylinder by splitting it longitudinally with a thin saw on one side. I then open the cylinder out flat or further bend it into the form of a cylinder, with the record upon its exterior. To give the necessary strength I provide a suitable backing. The result is a flat or cylindrical knurling surface having the record in relief, so that by rolling a wax phonogram-blank upon it the original record will be reproduced.

For making the first deposit upon the original wax phonogram I prefer to employ silver, which is deposited upon the wax phonogram by the vacuum process or by electroplating. A thin coating is produced in this way, which is backed up by a coating of lead or tin, which is also quite thin. For example, it may be one-sixteenth of an inch in thickness. The silver gives an inoxidizable surface, which is cheaper than gold or platinum. After the wax is dissolved out and this cylinder split on one side it will be found to have sufficient flexi-

bility by reason of the materials employed and the thinness of the cylinder to permit of its being bent without injury to the record into the form of a flat sheet or a reversed cylinder. If bent around a cylinder it will be secured to the same by cement, and if bent into a flat sheet it will likewise be secured to a suitable bed-plate, the cylinder or bed-plate giving the necessary strength to the record. The duplicate phonogram-blanks upon which I impress the original record by means of the knurl are preferably of a wax composition, which is too hard to be practically indented directly in the phonograph, although softer compositions may be employed, or materials other than wax.

In the accompanying drawings, forming a part hereof, Figure 1 is a sectional view showing the original phonogram with the deposit thereon; Fig. 2, a similar view with the original phonogram melted out or removed from the encircling metal deposit. Fig. 3 is a sectional view illustrating the flat knurling surface, and Fig. 4 a similar view illustrating the cylindrical knurling surface.

A is the original wax phonogram, upon the surface of which is the phonographic record, upon which is formed a thin deposit of silver, a, and over this a thicker deposit of lead or tin, b, the entire metallic deposit being, for illustration, one-sixteenth of an inch thick. After this deposit is made the wax cylinder A is melted out of the metal coating, leaving the metallic cylinder B (shown in Fig. 2) with the record in relief upon its inner surface. This cylinder B is split longitudinally on one side at the point c, and it is then bent out flat and mounted upon a suitable base-plate, C, to which it is secured by cement, forming a flat knurling-surface, D; or the cylinder B may be bent reversely over a solid cylinder, E, and secured thereto by cement, forming a cylindrical knurl, F. (Shown in Fig. 4.) The wax duplicate phonogram-blank G is impressed with the original record by rolling it against the flat or the cylindrical knurling surface, as will be readily understood.

I do not claim herein the method of duplicating phonograms by depositing metals upon a cylindrical wax phonogram and then melting or dissolving out the original wax phonogram, leaving a matrix with the record in relief upon its inner surface; neither do I claim



Inventor.  
T. A. Edison  
[Signature]



748

herein the use of a vacuum deposit for producing a coating upon the wax phonogram; neither do I claim herein a duplicate phonogram constructed of a hard material not capable of being satisfactorily indented by a phonograph, since these features are covered in my applications Nos. 743, 744, and 751, already filed by me. Such applications have respectively the Serial Nos. 259,895, 259,896, and 262,428.

What I claim as my invention is—

1. The process of duplicating phonograms, consisting in forming a knurl having the original record in relief by depositing metal upon the original record, removing the original phonogram and opening the metallic coating, and then impressing duplicate phonogram-blanks with the original record by means of such knurl, substantially as set forth.

2. The process of duplicating phonograms, consisting in depositing a flexible metallic coating upon an original cylindrical phonogram, removing the original phonogram from the inclosing-coating, splitting the inclosing-coating longitudinally, bending the same to form a knurl, and then impressing the duplicate phonogram-blanks with the original record by means of this knurl, substantially as set forth.

This specification signed and witnessed this 3d day of March, 1888.

THOS. A. EDISON.

Witnesses:

WM. PELZER,  
E. C. ROWLAND.





748  
(No Model.)

T. A. EDISON.  
PHONOGRAM BLANK.

No. 382,462.

Patented May 8, 1888.

Fig. 1.

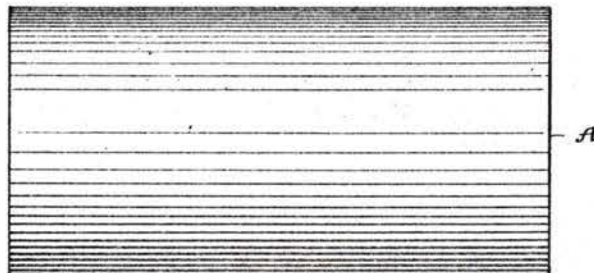


Fig. 2.

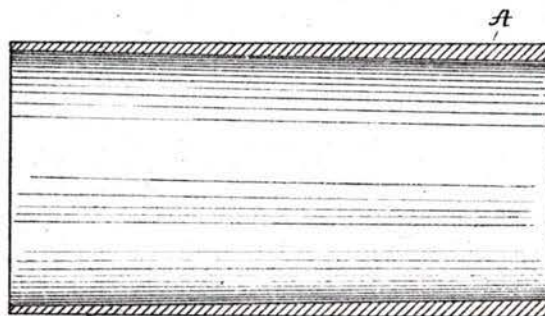
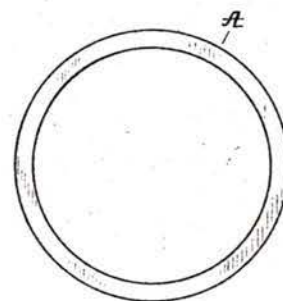


Fig. 3.



Witnesses:  
*E. Rowland*  
*William Byer*

Inventor.  
*Thomas A. Edison*  
By *Byer's Attorneys* *J. & Seely*

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# UNITED STATES PATENT OFFICE.

May 8, 1888.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

## PHONOGRAM-BLANK.

SPECIFICATION forming part of Letters Patent No. 382,462, dated May 8, 1888.

Application filed January 5, 1888. Serial No. 959,898. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonogram-Blanks and Phonograms, (Case No. 747,) of which the following is a specification.

I have found in practice that the most available surface for phonogram-blanks and phonograms is one composed of wax, gum, or other plastic hydrocarbon. Such compounds, however, I find contract and expand under variations of temperature to a much greater extent than paper, wood, metals, and other similar harder substances. While under ordinary conditions the wax or wax-like surface may not be injured by this difference in the coefficient of expansion, yet when subjected to extreme cold the contraction of the wax is so much greater than the harder backing that the wax will crack and destroy the continuity of the surface. For instance, a phonogram-blank or phonogram may be subjected to a temperature of nearly 100° Fahrenheit at one time and at another time the temperature may fall below zero. If the waxy substance is sufficiently hard at the high temperature to hold its shape under the pressure of one on the other in a packing-box, it will at the low temperature harden and contract so greatly in excess of the backing of harder material that the wax will crack and render the surface useless.

The object I have in view is to produce a phonogram-blank or phonogram which will have the wax or wax-like surface and will not be subject to the objection that has been stated. This I accomplish by constructing the phonogram-blank or phonogram wholly of the wax or wax-like material. I prefer to mold the entire phonogram-blank of the one wax-like compound; but I may construct the base or

backing of the surface of a somewhat different mixture of wax or wax-like materials than that of which the surface is made, so long as the whole has substantially the same coefficient of expansion.

My phonogram-blank I prefer to mold as a hollow cylinder with a tapering bore for slipping over the tapering phonogram-cylinder of my phonograph.

In the accompanying drawings, forming a part hereof, Figure 1 is an elevation of the phonogram-blank; Fig. 2, a longitudinal section thereof, and Fig. 3 an end view.

A is the cylindrical phonogram-blank, molded of the plastic wax or wax-like material, as described, and having a tapering bore.

The invention is also applicable to duplicate phonograms having the phonographic record thereon.

What I claim is—

1. A phonogram blank or phonogram constructed wholly of wax or wax-like materials and having the same coefficient of expansion throughout its mass, substantially as set forth.

2. A phonogram-blank or phonogram constructed as a hollow cylinder wholly of wax or wax-like materials and having the same coefficient of expansion throughout its mass, substantially as set forth.

3. A phonogram-blank or phonogram constructed as a hollow cylinder, with a tapering bore wholly of wax or wax-like materials, and having the same coefficient of expansion throughout its mass, substantially as set forth.

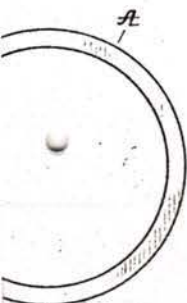
This specification signed and witnessed this 5th day of December, 1887.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,  
E. C. ROWLAND.

Fig. 3.



Inventor.

A. Edison

J. H. & S. L.









756 (No Model.)

G. H. HERRINGTON.

METHOD OF RECORDING SPEECH.

No. 397,856.

Patented Feb. 12, 1889.

Fig 1

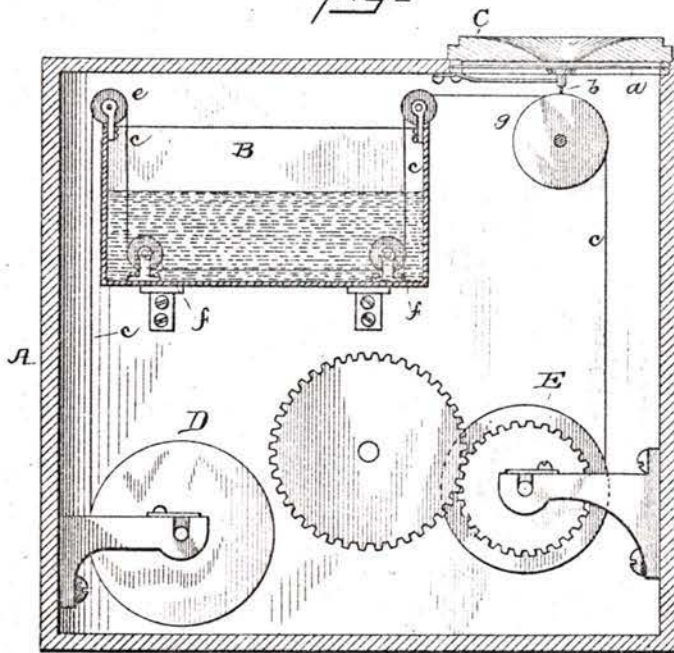


Fig 2.

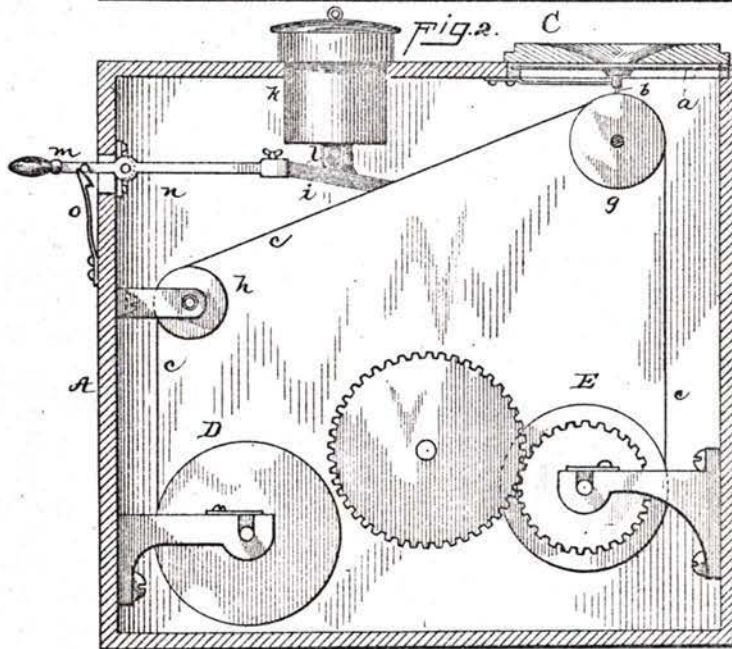


Fig 3.

INVENTOR:

ATTEST:

*Ed. Bowland,*  
*William P. Rizer*

*George H. Herrington*  
*By [Signature]*

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# UNITED STATES PATENT OFFICE.

Feb. 12, 1889.

GEORGE H. HERRINGTON, OF WICHITA, KANSAS, ASSIGNOR TO HIMSELF, AND  
EDWARD H. JOHNSON, OF NEW YORK, N. Y.

## METHOD OF RECORDING SPEECH.

SPECIFICATION forming part of Letters Patent No. 397,856, dated February 12, 1889.

Application filed June 18, 1887. Serial No. 241,795. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE H. HERRINGTON, of Wichita, in the county of Sedgwick and State of Kansas, have invented a certain new and useful Improvement in Phonographs, of which the following is a specification.

In my application filed September 11, 1886, is set forth a process of recording sound-vibrations by softening a material, passing it under the needle of a phonograph, and then allowing it to cool. In the application referred to I described the use as the recording medium of a material capable of being softened by heat and hardening when cooled.

My present invention relates to another specific process to the same end, one of whose advantages is that the appliances required for heating and cooling the material are dispensed with.

My improvement consists, mainly, in the employment as a recording medium of a material which is softened by a chemical solvent before passing under the vibrating needle, and afterward hardens as it dries.

I prefer to place the material upon the surface of a thin flexible strip, which is fed by suitable mechanism from a drum on one side of the apparatus to one on the other side, passing under the vibrating needle, and before reaching such needle coming in contact with the solvent. Suitable materials for the purpose are celluloid, glue, wax, molasses, pitch, asphalt, or various glutinous or resinous substances, or two or more of such substances in combination. A compound which I have found especially advantageous is one of celluloid mixed with a smaller quantity of molasses and beeswax, the celluloid and beeswax being dissolved with ether or other suitable solvents before mixing. This mixture I then spread evenly on a strip of paper or other suitable surface and allow it to dry hard, and then finish it with as smooth a surface as possible. Another combination which I have used to great advantage is one of glue, molasses, and wax, applied in a similar manner to that just described. This forms a particularly smooth and glossy surface, and prevents largely the harsh grating sound, which is an objection when tin-foil is used.

I employ solvents suitable for the particu-

lar material used. For instance, with celluloid I may use ether, with glue, and water, which may be heated, or with other materials alcohol, ammonia, or acetic acid, the proper solvent being employed for the material used, as will be readily understood.

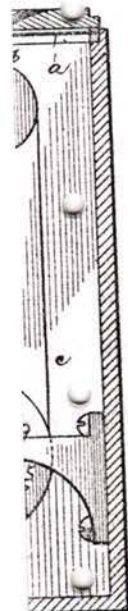
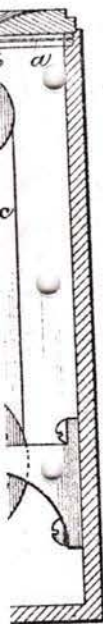
Convenient apparatus for carrying my invention into effect is illustrated in the accompanying drawings.

Figure 1 illustrates a form of apparatus in which the strip is passed through a bath of the solvent. Fig. 2 illustrates a form in which the solvent is applied by means of a brush, and Fig. 3 is a view of a portion of the strip.

In Fig. 1, A represents a suitable inclosing box or case. B is a vessel containing the solvent. C is the mouth-piece or ear-piece, a the diaphragm, and b the vibrating point or needle. D is a spool or drum carrying the strip c, on which the sound-vibrations are to be recorded. This is a strip of paper or other suitable flexible material of sufficient strength for the purpose, and is covered with the soluble substance d, Fig. 3, such as above described. This strip passes over a roller, e, and then over the two rollers f f in the vessel B, under the surface of the liquid, then over the roller g, which brings it directly under the needle, and, finally, to the receiving drum or spool E, on which it is wound, this drum being revolved by a spring or any suitable motor, as indicated, so as to move the strip when in operation continuously along under the needle. As the strip passes through the solvent its surface is softened by the action thereof, so that it readily receives the impressions of the needle as it vibrates in accordance with sound-vibrations projected against the diaphragm. The drum E is placed at a sufficient distance, so that the surface dries before the strip is wound thereon. The surface of course hardens as it dries, so that the impressions remain permanently thereon.

The drums are preferably removable, so that the drum, with the record upon it, may be removed, and such record may be reproduced by placing the drum in a similar machine, of course with the solvent omitted, and passing it under the needle.

In the form shown in Fig. 2 the strip c passes from the spool D to the spool E under



INVENTOR:

*George H. Herrington*  
*Edward H. Johnson*  
Attys.



the needle, as before. The vessel and the rollers therein are omitted, and the strip passes directly from a roller, *h*, supported on the side of the case to the roller *g* under the diaphragm.

5 Between the rollers *h* and *g* a brush, *i*, rests lightly on the top of the strip. In this case this brush takes the place of the vessel of Fig. 1 as the receptacle for the solvent. A vessel, *k*, is supported by the top of the box,

10 which vessel contains the solvent. From an aperture in the bottom of the vessel a porous body, *l*, which is preferably a mass of fibrous or spongy material—as wicking or sponge—hangs down and rests on the brush *i*, whereby

15 the brush is kept constantly provided with the solvent. The traveling strip is therefore continually moistened with the liquid as it moves and reaches the needle, with its surface in the desired soft and impressible condition.

20 I prefer to provide the brush with a handle, *m*, pivoted at *n* and passing through a slot in the side of the case, whereby when the machine is not in use, or when it is in use for reproducing sound, the strip may be removed

25 down on the projecting handle. A spring-catch, *o*, is preferably provided for holding the brush away from the strip. The drum *E* is turned by a suitable motor, as before.

I do not claim herein the method of recording sounds by softening the recording medium, passing it through the recording-instrument while in such softened condition, and then allowing it to harden to set the impressions, since this is claimed in my prior application, filed September 11, 1886.

What I claim is—

1. The method herein described of making a permanent record of vibrations, which consists in softening a body of material by a chemical solvent, passing the same through the recording-instrument while it is in a softened condition, and then allowing it to harden.

2. The method of recording phonetic vibrations, which consists in covering a strip of material with a substance capable of being softened by a chemical solvent, subjecting said substance to the action of such solvent, passing it in its softened condition under the vibrating point of a phonograph, and afterward allowing it to harden to fix the phonogram, substantially as set forth.

This specification signed and witnessed this 13th day of June, 1887.

GEORGE H. HERRINGTON.

Witnesses:

RICHARD B. REILAY  
F. J. ARNOLD.

Correction in Letters Patent No. 397,856.

It is hereby certified that in Letters Patent No. 397,856, granted February 12, 1889, upon the application of George H. Herrington, of Wichita, Kansas, for an improvement in "Method of Recording Speech," an error appears in the printed specification requiring the following correction, viz: On page 1, in line 53, the word "and" should be stricken out; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 19th day of February, A. D. 1889.

[SEAL.]

Countersigned:

BENTON J. HALL,  
Commissioner of Patents.

D. L. HAWKINS,  
Assistant Secretary of the Interior.





756  
(No Model.)

G. H. HERRINGTON.

PROCESS OF DUPLICATING PHONOGRAMS.

No. 399,265.

Patented Mar. 12, 1889.

Fig. 1.

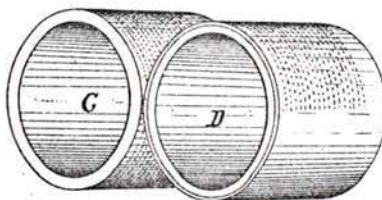


Fig. 2.

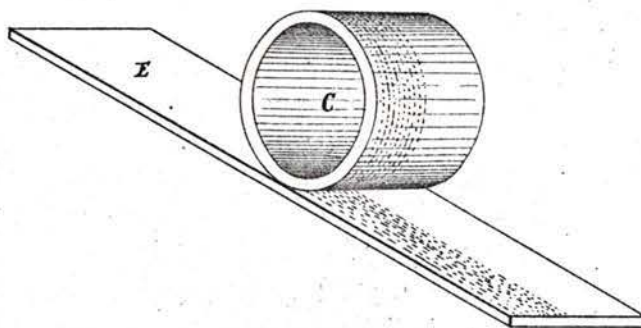
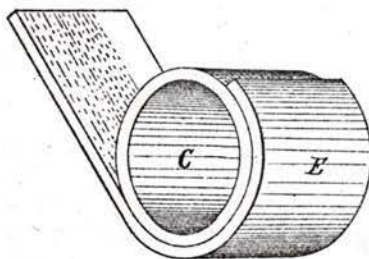


Fig. 3.



Witnesses,

J. E. A. Smith  
J. L. Babb.

Inventor.

George H. Herrington.  
By *M. J. Hutchins.*

*Atty.*

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# UNITED STATES PATENT OFFICE.

S.  
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GEORGE H. HERRINGTON, OF WICHITA, KANSAS.

## PROCESS OF DUPLICATING PHONOGRAMS.

SPECIFICATION forming part of Letters Patent No. 399,265, dated March 12, 1889.

Application filed September 21, 1888. Serial No. 285,978. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE H. HERRINGTON, a citizen of the United States of America, residing at Wichita, in the county of Sedgwick and State of Kansas, have invented certain new and useful Improvements in the Process of Making Duplicate Copies of Phonograms, of which the following is a specification, reference being had therein to the accompanying drawings and the letters and figures of reference thereon, forming a part of this specification.

This invention relates to certain improvements in the process of making duplicate copies of phonograms; and it consists, first, in preparing a phonograph-cylinder with a coating of wax or composition which is adapted to be softened by heat, in registering the sound-waves from a phonograph upon said prepared cylinder while its wax or composition is in a soft state, then in permitting said wax or composition to cool and harden and thus preserve its developed characters; second, in preparing sheets of said wax or composition, in softening said sheets by means of heat, and applying and pressing them about the cylinder having the original phonogram, or rolling said cylinder across said sheet with pressure to impress the phonogram-registrations upon the surface of said sheets, when the sheets are permitted to harden or set, and if about said cylinder removed, and thus said sheets are impressed with a negative duplicate copy of the original phonogram; and, third, in preparing duplicate cylinders with a coating of said wax or composition, and while they are in a soft state from the influence of heat they are either rolled across the sheet having the negative copy or said sheets placed about said cylinders, and in either instance pressure is applied sufficiently to impress a positive duplicate copy in the surface of said duplicate cylinders from the said negative copy. Then each is permitted to set or harden to preserve the duplicates thus obtained.

Figure 1 represents the process of copying the registrations of the sound-vibrations of an original phonogram upon the surface of a cylinder of similar dimensions by means of compression. Fig. 2 represents a similar process of copying said registrations upon a

plane surface, and Fig. 3 represents the process of copying said registrations upon a plane sheet of the copying material by means of 55 placing said material about the cylinder having the original record thereon and by holding said material compressed thereabout until the characters are developed.

Referring to the illustrations, c represents 60 a phonograph-cylinder having registered thereon the original phonogram.

D represents a cylinder of similar dimensions having a coat or covering of either wax, resin, pitch, celluloid, glue, rubber, or 65 their compound, or some equivalent material adapted to be softened by means of heat or otherwise, so it will receive and retain the impression in reverse duplicate of the record made on the original phonogram by means of 70 rolling the surfaces of the said two cylinders together with sufficient pressure to properly cause the record to be copied. (See Fig. 1.)

E represents a prepared sheet or plane surface of either wax, resin, pitch, celluloid, rubber, or 75 their compound, or some equivalent material, as before stated, which is adapted to be softened by means of heat or otherwise and used in some instances in place of the cylinder D for receiving and retaining in reverse duplicate 80 the record made on the original phonogram by means of rolling the cylinder having the original record over the surface of said sheet or plane with sufficient pressure to properly cause the record to be copied, as in 85 the former manner, (see Fig. 2,) and thus by the process described a fine reverse duplicate or negative of the original phonogram is produced, and when the said copying material upon which the copy is made becomes cool it 90 will set and become firm and retain a rigid copy. In instances where certain kinds of said copying material are used which will form into flexible sheets it is placed about the cylinder having thereon the original 95 phonogram while soft and retained thereon by suitable pressure until the copy has been impressed and the material has become set and the several characters well developed. (See Fig. 3.) 100

To produce positive duplicates of the original phonogram, duplicate copying cylinders or sheets are prepared in like manner as above described and subjected to the same

inventor.  
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his.  
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process and pressure in contact with the cylinder or sheet having the reverse or negative copy of the original phonogram thereon, and when the positive duplicate copies of the original phonogram have set and their registrations have become firm they may be used in reproducing the sound-vibrations in a phonograph.

Any desired number of positive duplicate copies of the original phonogram may be made from the reverse or negative copy thereof in the manner and by the process stated. Duplicate positive copies of the original phonogram may be made from the reverse or negative duplicates thereof on soft wax.

The essential features of my invention consist in using one or more of the materials as follows: wax, resin, pitch, celluloid, glue, rubber, or their compound or equivalent, applied to a cylinder or roll or formed in plane sheet or strips, wherein they are adapted to be softened by means of heat or otherwise, so as to receive and retain, first, the reverse duplicate copy of the original phonogram, and, second, by using the said reverse duplicate copy for producing positive duplicate copies of the original phonogram.

The use to which this process of duplicating the registrations of the sound waves or vibrations is applied is in phonographs or any machine calculated to register sound waves or vibrations, as in telegraphic, electric, and other minute operations of similar character.

I am aware of the use of plastic material and materials adapted to be softened in various ways and impressed with characters and permitted to set or harden while in contact with the object of which the impression is taken; but I am not aware that the herein-described process has heretofore been used, wherein a phonograph-cylinder is first covered with a coating of wax or composition which is adapted to be softened by heat and the phonogram-record made thereon while said coating is softened from the influence of heat, then permitted to harden, then in preparing sheets or strips of said wax or composition material and applying said sheets in contact with the original recorded cylinder when in a soft state from the influence of heat, thus impressing said sheet with a negative copy of the original record, then permitting said sheet to set to preserve the form of its copy, and removing it apart from the original record and applying duplicate cylinders, which are prepared with a coating of said wax or composition, in contact with said negative copy of said sheet while said duplicate cylinders are softened from the influence of

heat, so they will receive in their surface an impressed positive duplicate copy of the original phonogram, and then permitted to harden to preserve such copy, thus producing any number of positive duplicate copies of the original phonogram-record in such form as that it may be used in reproducing the sound-vibrations in a phonograph.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows, to wit:

1. The herein-described process of making duplicate copies of original phonograms, consisting in preparing a phonograph-cylinder with a coating of wax or composition which will soften under the influence of heat, thus forming a surface upon which to register the phonogram when said surface is in a soft state, then permitting said recorded surface to harden, in applying a sheet or strip prepared from said wax or composition, while in a soft state from the influence of heat, in contact with said hardened recorded surface of the original phonogram, impressing said sheet or strip with said record, and while in such contact permitting the wax or composition to set, in removing said impressed sheet or strip from contact with the record, thus producing a negative duplicate copy; and in applying duplicate cylinders having a coating of said wax or composition in contact with said negative copy while the coatings of said cylinders are softened from the influence of heat, impressing in their surface a positive duplicate copy of the original phonogram from said negative, substantially as and for the purpose specified.

2. The herein-described process of making duplicate copies of original phonograms, consisting in pressing sheets of wax or composition which is adapted to soften from the influence of heat in contact with the original phonogram while in a soft state, then permitting it to set, thus impressing said sheet with the original record, in removing said sheet or strip from contact with the original record, thus forming a negative duplicate copy, and in applying duplicate cylinders having a coating of said wax or composition in contact with said negative copy while the coatings of said cylinders are softened from the influence of heat, thus impressing in their surface a positive duplicate copy of the original phonogram from the negative record, substantially as and for the purpose specified.

GEORGE H. HERRINGTON.

Witnesses:

F. E. A. SMITH,  
J. G. BABB.





(No Model.)

T. A. EDISON.  
PHONOGRAPH.

No. 430,278.

Patented June 17, 1890.

FIG.1.

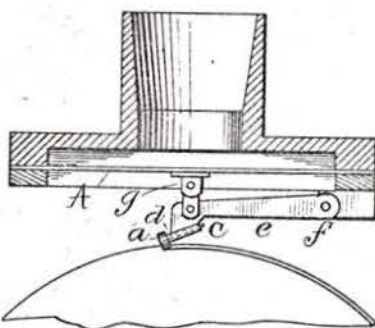


FIG. 2.

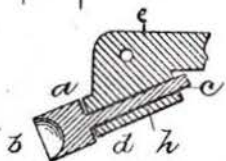


FIG. 4.



FIG. 3.

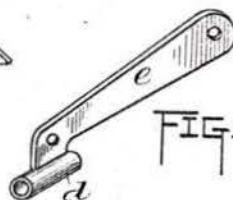


FIG. 5.

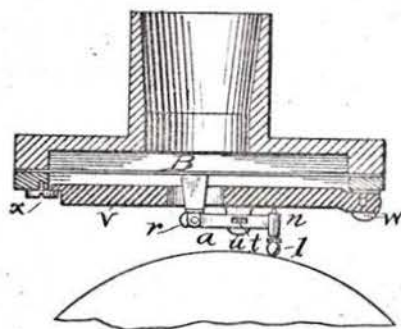


FIG. 6.

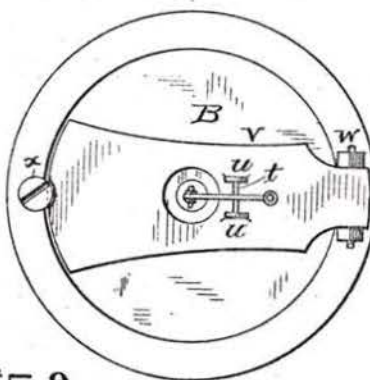


FIG. 7.

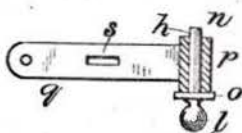


FIG. 9.

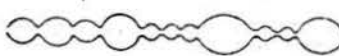


FIG. 8.



Witnesses  
E. Cowland,  
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By his Attorneys

Inventor:

Thomas A. Edison

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# UNITED STATES PATENT OFFICE.

le 17, 1890.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

## PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 430,278, dated June 17, 1890.

Application filed April 10, 1889. Serial No. 306,670. (No model.)

### *To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 833,) of which the following is a specification.

This invention relates to the recording and reproducing points of the phonograph, and has for its objects such an improvement in the form and construction of such devices and in the manner of arranging and supporting the same as, in the first place, to materially improve the character of the sounds produced by the instrument, so as to make them more accurately reproduce the sound-vibrations communicated to the recorder than has heretofore been found possible; secondly, to make the instrument of a less delicate character and more readily manipulated and adjusted by inexperienced persons, and, thirdly, to enable the recording-point to be used for a longer period of time without having to be sharpened or reground or replaced by another.

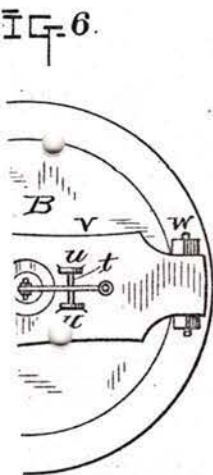
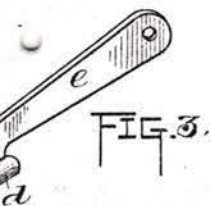
One feature of my invention consists in the use of a recording-point having a cutting-edge, which is a portion of the edge of a cylinder and forms a gouging-edge, or one which cuts a rounded groove, so that the indentations due to the movements of such point are circular and with curved sides sloping to the center instead of square, and with straight sides, such as are produced by the straight-edged cutting-points which have heretofore been used. I prefer to employ a recording-point whose end is formed into a complete circular edge—that is to say, the end of a cylindrical head is cupped or hollowed out so as to produce a thin circular cutter, so that when one part of the edge becomes worn or dulled the stem may be turned and a different part of the circumference or a new curved cutting-edge is brought into position to operate on the phonogram-blank. To readily accomplish this and also to produce a means of holding the recording-point which shall enable the latter to be readily removed and easily replaced in position by unskilled persons, I provide the point with a shank which

is inserted into a socket and held therein removably, preferably by means of a little cement, which can be readily softened by heat, such as a small quantity of shellac. I prefer to support the reproducing-point in the same way, so that it also can be readily removed and replaced when necessary. I employ, also, a reproducing-point having a convex circular bearing-surface—that is to say, a bearing-surface which is the surface of a portion of a sphere. I prefer to employ as a reproducing-point a ball or sphere at the end of a suitable stem. This is supported so that it has a slight movement laterally of the record, and when traveling in the circular depressions formed by the recording-point it fits such depressions, and even if the lever which carries it is out of line with the record, so that the ball does not stand vertically in the record, or if it bears against the curved sides of the depressions, it reproduces the vibrations with the same exactness. The effect of the weight of the reproducing-point and attached parts is such, however, that the point always tends to go to the bottom or center of a depression. With the curved recording-point the whole depression forms the record of the sound-wave, and not only the bottom of it as with a straight recording-point, so that if the spherical reproducer touches the surface of the depression at any point it gives an accurate reproduction.

If a straight-sided reproducing-point gets out of line or tilted laterally, it does not reproduce accurately, and with straight-sided depressions if the reproducing-point bears against the sides it does not reproduce perfectly and it cuts through the sides and scrapes against them so as to produce imperfect articulation and injure the record itself.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a section of the case and mouth-piece of the recorder with the recording-point and attached parts shown in elevation and with the point itself on an enlarged scale; Fig. 2, a longitudinal section of the recording-point and holder therefor; Fig. 3, a perspective view of the holder and the lever which carries it; Fig. 4, a perspective view of a modified form of recording-point; Fig. 5, a



Inventor

T. A. Edison

By [Signature]



view of the reproducer, similar to Fig. 1; Fig. 6, a bottom view of the reproducer; Fig. 7, a side elevation of the reproducing-point and the parts which hold and support it, the tubular holder being shown in vertical section; Fig. 8, a view of a modified form of reproducing-point; and Fig. 9, an illustration of the form of the record produced by the arc-shaped recording-point, the view being of the character of a plan view.

The recording-point consists, preferably, of a cylindrical piece *a*, whose end is hollowed or cupped out, as illustrated in Fig. 2, so that a very fine and sharp circular edge *b* is formed. From the part *a*, which is the head of the recording-tool, a shank *c* extends, which is preferably round, and which enters a tubular holder *d*, attached by soldering or otherwise to the lower side of the usual lever *e*, pivoted at *f* on the rim of the reproducer, and connected at *g* with the center of the diaphragm A. Preferably the shank *c* is cemented in the holder *d* by the application of a little shellac or other suitable material *h*, which can readily be softened by heating it; but instead of this the secure removable attachment of the shank in the sleeve may be attained by suitable mechanical holding devices of various kinds, as will readily be seen.

It will be seen that only the lower portion of the circular tool meets the surface of the phonogram-blank, so that the cutting-edge in use at any time is shaped as the arc of a circle whose center is outside of the recording-surface. The circle of the cutting-edge is in practice exceedingly small, being necessarily exaggerated for illustration in the drawings. For a phonograph which has one hundred threads to the inch on its feed-screw, I prefer to make the diameter of the circular cutting-tool about forty-thousandths of an inch. It is of course not necessary for the production of the peculiar character of record desired that the edge shall be a complete circle. It may be a semi-circle or other portion of a circle, as illustrated in Fig. 4, in which the head *i* is formed at its lower side only with a cutting-edge *k*, shaped as the arc of a circle whose center is outside the recording-surface and provided like the other with a shank *c* for insertion in the holder. But by making it circular I provide several curved cutting-edges—two or more—and I enable the same recording-point to be used for a much longer time without having to be replaced or sharpened, for when any portion of the edge has been used long enough to become worn or dulled the cement in the holder may be softened by the application of a low degree of heat and the shank turned in the holder or withdrawn and inserted in a different position, so as to bring a fresh arc-shaped cutting-edge into operative position, and this may be repeated several times before the whole circumference has been used. It will be seen that this is an operation which does not require especially skillful manipulation, but

can readily be performed by any one, and this is an important advantage because the phonograph must necessarily be placed usually in the hands of unskilled and inexperienced persons. The advantages of the peculiar form of holder are, however, not confined to its use with the circular cutting-edge, for this evidently is a desirable form of holder for recording and reproducing points of any character when the same are provided with shanks or extensions capable of being inserted and held in the holder, since it enables such recording or reproducing points to be readily removed and replaced by any one without the exercise of any especial skill or knowledge and without any delicate adjustment, the parts being so arranged that when the head or other enlarged portion meets the holding-sleeve, the point is in the proper position for operation. It is evident, also, that the holding-sleeve and shank are not necessarily round in cross-section, since the same may readily be made square or of other polygonal shape. Of course in this case the shank cannot be turned in the sleeve; but it can readily be withdrawn, turned, and replaced in a new position.

The character of the record produced by the curved or arc-shaped cutting recording-tool is indicated in Fig. 9. It will be seen that such record takes the form of a series of circular pits or depressions whose walls curve toward the center or bottom point, and that the width of such depressions is in proportion to their depth, and also that every portion of each depression contains the record of the sound-wave, so that if the reproducer enters the depression and touches at any point it will receive the required movement corresponding to the impressed sound-wave.

The head of the reproducing-point is preferably a ball or sphere *l*, but it may be only a portion *m* of the sphere, as illustrated in Fig. 8. Such head preferably has a shank *n*, provided with a flange *o*, and such shank enters the holding-sleeve *p* until the flange meets the holder and is secured preferably in the same manner as hereinbefore described with reference to the recording-point—that is to say, by a small quantity of shellac or similar cement *h*, or screwed in.

The holder *p* is attached to or made in one piece with a lever *q*, which is connected at *r* in the usual manner by a hinge with the center of the reproducing-diaphragm B. The lever *q* has a slot *s*, and through such slot passes a pin *t*, extending between lugs *u*, which depend from a plate *v*, pivoted at *w* on the rim of the reproducer and kept from falling out of place *y* the head *x* of the screw on the opposite side of the rim from the pivot. The plate *v* forms a weight which bears on the reproducing-point and tends to force the same always to the bottom of the recorded indentations, the slot *s* allowing a slight lateral rocking movement of the reproducing-point so that if the lever is out of line with the record the point itself can rock into the

required position bearing-surface it stands straight and is inclined toward the center. It also forms a guide for the diaphragm and is described and claimed in a patent dated February 1, 1898, under the name of the reproducing-point, but under slow motion it yields and conforms to the point to conform to the record.

What I claim is: 1. In a phonograph, a reproducing-point, thereby having substantially as set forth.

2. In a phonograph, a diaphragm, thereby having substantially as set forth.

3. In a phonograph, a record-surface, a curved cutting tool, and a recording-point, thereby having substantially as set forth.

4. In a phonograph, a cylindrical phonogram, and a recording-point, thereby having substantially as set forth.

5. In a phonograph, a holding-sleeve, and a recording-point, thereby having substantially as set forth.

6. In a phonograph, a holding-sleeve, and a recording-point, thereby having substantially as set forth.

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12. In a phonograph, a holding-sleeve, and a recording-point, thereby having substantially as set forth.

13. In a phonograph, a holding-sleeve, and a recording-point, thereby having substantially as set forth.

14. In a phonograph, a holding-sleeve, and a recording-point, thereby having substantially as set forth.

15. In a phonograph, a holding-sleeve, and a recording-point, thereby having substantially as set forth.



by any one, and advantage because the same may be placed usually by unskilled and inexperienced persons of the peculiar form of the reproducing-point is not confined to its use as a cutting-edge, for this evi-  
 dence of holder for recording-points of any character, provided with shanks of being inserted and removed enables such recording-points to be readily changed by any one without special skill or knowledge of delicate adjustment. It is arranged that when the reproducing-point meets the holder in the proper position, also, that the holder is not necessarily round, the same may readily be of any polygonal shape. Of course, the shank cannot be turned and readily be withdrawn, in a new position.  
 The record produced by the cutting recording-tool will be seen that the form of a series of circles whose walls curve to a bottom point, and that the pressure is in proportion also that every portion contains the record, so that if the reproducer touches at any point, it will produce the required movement corresponding to the sound-wave.  
 The reproducing-point is preferably of the form shown in Fig. 7, but it may be of any other shape, as illustrated in Fig. 8, which preferably has a shank, as in Fig. 9, and such shank may be pivoted until the flange is secured preferably as hereinbefore described. The recording-point—that is, the tip of the shellac or similar material—is attached to or made in one piece which is connected at one end by a hinge with the center of the diaphragm B. The lever and through such slot between lugs u, which are pivoted at w on the lever, and kept from falling by a lead x of the screw on the rim from the pivot. The weight which bears on the lever and tends to force the lever to the bottom of the recorded groove, allowing a slight lateral movement of the reproducing-point, so that the lever is out of line with the shank, and itself can rock into the

required position, and its having a rounded bearing-surface makes it immaterial whether it stands straight in the depression or is inclined toward one side thereof. The weight also forms a retarding device, such as is described and claimed in my patent, No. 397,280, dated February 5, 1889, since it does not move under the quick vibrations communicated to the reproducing-point by the sound-record, but under slow movements due to irregularities or inaccuracies of the surface of the phonogram or eccentric movements of rotation it yields and permits the reproducing-point to conform to such irregularities.

What I claim is—

1. In a phonograph, the combination, with a diaphragm, of a recording-point carried thereby having a curved cutting-edge, substantially as set forth.
2. In a phonograph, the combination, with a diaphragm, of a recording-point carried thereby having a circular cutting-edge, substantially as set forth.
3. In a phonograph, the combination, with a record-surface, of a recording-point having a curved cutting-edge and entering said record-surface in an oblique direction, substantially as set forth.
4. In a phonograph, the combination of a cylindrical phonogram-blank, a diaphragm, and a recording-point carried by the diaphragm having a curved cutting-edge, substantially as set forth.
5. In a phonograph, a recording-point having two or more cutting-edges, in combination with a holder holding such point normally in a fixed position, and in which such position may be changed to bring such cutting-edges successively into operating position, substantially as set forth.
6. In a phonograph, a recording-point having two or more arc-shaped cutting-edges, in combination with a holder holding said point normally in a fixed position, and in which the position of the point may be changed to bring such edges successively into operating position, substantially as set forth.
7. In a phonograph, a recording-point having a circular edge, in combination with a holder holding such point normally in a fixed position, and in which the position of the point may be changed, substantially as set forth.
8. In a phonograph, a recording-point having two or more cutting-edges, in combination with a holder in which the point may be turned to bring such cutting-edges successively into operating position, substantially as set forth.
9. In a phonograph, the combination of a recording or reproducing point having a shank or extension, and a sleeve for holding the same, substantially as set forth.
10. In a phonograph, the combination, with a holding-sleeve, of a recording or reproducing point having a shank, and an enlarged

portion meeting said sleeve when the shank is inserted therein, substantially as set forth.

11. In a phonograph, a reproducing-point whose bearing-surface is the surface of a portion of a sphere, substantially as set forth. 70

12. In a phonograph, a spherical reproducing-point, substantially as set forth.

13. A sound-record consisting of circular indentations or depressions having rounded sides and corresponding to the sound-waves, substantially as set forth. 75

14. A sound-record consisting of circular indentations or depressions having rounded sides and corresponding to the sound-waves, in combination with a diaphragm and reproducing-point whose bearing-surface is the surface of a portion of a sphere, substantially as set forth. 80

15. In a phonograph, a reproducing-point pivoted so as to have a lateral movement, in combination with a weight bearing thereon, substantially as set forth. 85

16. In a phonograph, a reproducing-point having a bearing-surface which is the surface of a portion of a sphere and pivoted so as to have a lateral movement, in combination with a weight bearing thereon, substantially as set forth. 90

17. In a phonograph, a reproducing-point having a bearing-surface which is the surface of a portion of a sphere and pivoted so as to have a lateral movement, substantially as set forth. 95

18. In a phonograph, a laterally-rocking spherical reproducing-point, in combination with a weight bearing thereon, substantially as set forth. 100

19. A sound-record consisting of circular indentations or depressions corresponding to sound-waves, in combination with a reproducing-point whose bearing-surface is the surface of a portion of a sphere, and which is pivoted so as to have a lateral movement, substantially as set forth. 105

20. In a phonograph, the combination of the reproducing-point, the lever carrying the same and connected with the diaphragm, the hinged plate, and the hinge-connection between said lever and said plate, substantially as set forth. 110

21. In a phonograph, the combination of the reproducing-point, the lever carrying the same and connected with the diaphragm and having a longitudinal slot, the hinged plate, the lugs on said plate, and the pin connecting said lugs and passing through said slot, substantially as set forth. 115

22. In a phonograph, a recording-point having a cylindrical head provided with a cutting-edge and a shank or extension, substantially as set forth. 120

23. In a phonograph, a recording-point having a cylindrical head with its end hollowed to form a circular cutting-edge, substantially as set forth. 125

24. In a phonograph, a recording-point hav-



ing a cylindrical head with its end hollowed to form a circular cutting-edge and a shank or contracted extension, substantially as set forth.

5 25. In a phonograph, a reproducing-point having a head whose bearing-surface is a portion of the surface of a sphere, and a shank or contracted extension, substantially as set forth.

10 26. In a phonograph, a reproducing-point having a spherical head and a contracted shank, substantially as set forth.

27. In a phonograph, a reproducing-point having a spherical head, a contracted shank, 15 and a flange on said shank, substantially as set forth.

28. In a phonograph, the combination, with a diaphragm, of a sleeve connected with said diaphragm so as to receive motion therefrom 20 and a recording or reproducing point removably and rigidly held in said sleeve, substantially as set forth.

29. In a phonograph, the combination of a diaphragm, a lever connected therewith, a

sleeve carried by said lever, and a recording or reproducing point removably held in said sleeve, substantially as set forth.

30. In a phonograph, the combination of a diaphragm, a lever connected therewith, a sleeve carried by said lever, and a recording or reproducing point having a head and a shank or contracted extension removably held in said sleeve, substantially as set forth.

31. In a phonograph, a recording or reproducing point in combination with a holding-sleeve and a cement, such as will be softened by heat, holding said point in said sleeve, substantially as set forth.

32. In a phonograph, the combination of a recording-point having a curved cutting-edge and a reproducing-point having a rounded bearing-surface, substantially as set forth.

This specification signed and witnessed this 8th day of April, 1889.

THOMAS A. EDISON.

Witnesses:

WILLIAM PELZER,  
D. H. DRISCOLL.





(No Model.)

T. A. EDISON.  
PROCESS OF DUPLICATING PHONOGRAMS.

No. 484,582.

Patented Oct. 18, 1892.

FIG. 1

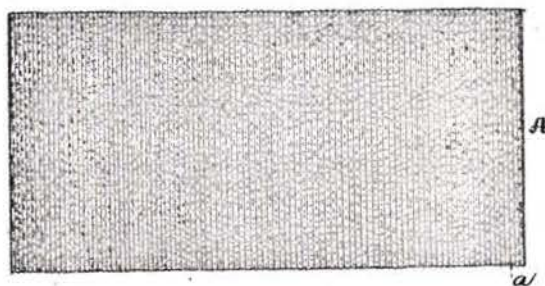


FIG. 2.

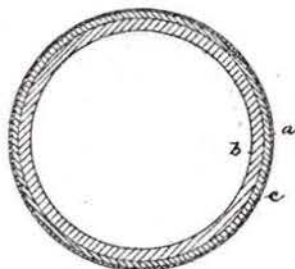


FIG. 3.

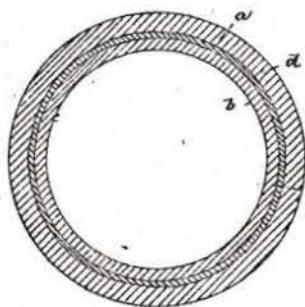


FIG. 4.

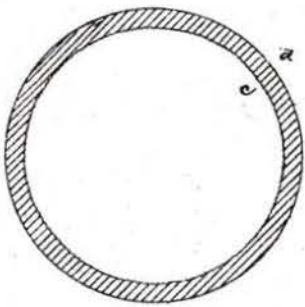


FIG. 5.

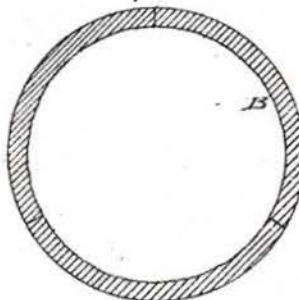


FIG. 6.

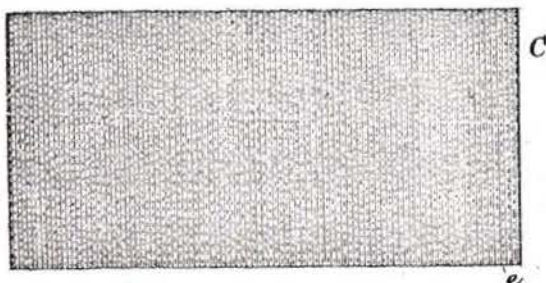
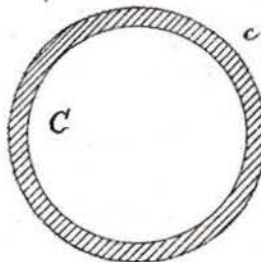


FIG. 7.



Witnesses  
Ed. Howard  
William R. Rizer

Inventor  
Thomas A. Edison  
By his Attorney Dyer & Leidy

UNIT

THOMAS A. EDISON.

PI

SPECIFICATION

Original application filed

To all whom it may concern:

Be it known that I, Thomas A. Edison, of the State of New Jersey, have invented a new and useful Process of Duplicating Phonograms, (Case No. 484,582) and I hereby claim as my invention a specific

The object of my invention is to provide a practical process of duplicating phonograms.

My invention relates to the construction of phonographic records, and more particularly to the construction of phonographic records by the use of a matrix, preferably a mold duplicate of a phonographic record, the surface thereof being constructed of a material of a matrix of a phonographic record, and the surface thereof being constructed of a material of a matrix of a phonographic record.

My invention relates to the construction of phonographic records, and more particularly to the construction of phonographic records by the use of a matrix, preferably a mold duplicate of a phonographic record, the surface thereof being constructed of a material of a matrix of a phonographic record.

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NOGE MS.  
nted Oct. 18, 1892.

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, ASSIGNOR TO  
THE EDISON PHONOGRAPH COMPANY, OF NEW JERSEY.

## PROCESS OF DUPLICATING PHONOGRAMS.

SPECIFICATION forming part of Letters Patent No. 484,582, dated October 18, 1892.

Original application filed January 5, 1888, Serial No. 259,895. Divided and this application filed January 30, 1888. Renewed  
March 30, 1892. Serial No. 427,011. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Process for Duplicating Phonograms, (Case No. 751,) of which the following is a specification.

The object I have in view is to produce a practical process for the duplication of phonographic records, so that the new art of phonographic publication can be established. Generally I propose to construct a suitable matrix, preferably in metal, and by its use mold duplicate phonograms with the phonographic records thereon, such phonograms or the surface thereof being preferably constructed of a material too hard for the satisfactory indentation thereof by the phonograph-recorder; but the duplicate phonograms may be made of a softer material. For the construction of the matrix I employ the process of vacuum deposit described in my application, Serial No. 118,942, filed January 28, 1884. The original phonogram is preferably constructed with a surface of wax or a similar material. This is placed in a suitable phonograph and the phonographic record produced thereon. The phonogram so impressed with the phonographic record is placed in a high vacuum, in which an electric arc, continuous or discontinuous, is produced between electrodes of metal or in which metal vapor is otherwise produced. The electric arc produces a vapor of the metal of which the electrodes are composed, which vapor or a metallic vapor otherwise produced within said chamber is deposited on the indented surface of the phonogram, forming a layer of metal thereon, which follows accurately all the indentations of the record, however minute, owing to the highly-communited condition of the metal deposited. The phonogram while the deposit is taking place in the vacuum-chamber is revolved slowly by a suitable power-connection, and this is especially necessary when the form of the phonogram is cylindrical, which it preferably is. The vacuum deposit is continued until the layer of metal is sufficiently thick, when the covered phonogram is removed from the vacuum-chamber and is further

covered by a more rapid process to give strength and body to the covering. A further covering of metal may be produced by electroplating a metal upon the vacuum deposit in the usual manner of electroplating, or the vacuum deposit may be backed up by casting upon it type-metal or other metal or alloy having a lower fusing-point than the vacuum deposit, or this may be done after electroplating upon the vacuum deposit, or the vacuum deposit may be backed up by a cement or gum or by plaster-of-paris; but a metal backing is preferred. The material of the original phonogram is then dissolved off of the metal covering, leaving in the case of cylindrical phonograms a hollow metal cylinder or one internally faced with metal, carrying the phonographic record in relief upon its inner surface. This metal cylinder is then split longitudinally by a very thin saw into a number of parts—say, for illustration, three parts—which are suitably mounted upon levers, so that a mold is formed, which can be closed to receive the material to be molded and opened to permit of its being taken out. The duplicate phonograms are produced by means of this mold by pouring therein and preferably around a suitable core placed in the mold suitable substances, such as wax or wax-like material, resin, or plaster-of-paris, the material being preferably too hard to be satisfactorily indented by the phonograph, or the duplicate phonograms may be made by taking sheets of smooth material, like waxed paper or tin-foil, and pressing them upon the surface of the mold by a plunger or otherwise, the sheets being afterward backed up by a wax, resin, or cement. The latter way of making the duplicate phonograms is especially applicable to flat-surface phonograms, although it may be used for phonograms with cylindrical surfaces. The production of the first layer of metal upon the phonograph-record by means of the vacuum deposit has great advantages over doing this by electroplating. In electroplating the wax-surface must first be covered by plumbago or gold-leaf or silver salts reduced by chemical reagents in order to form a conducting basis for the plating. The plumbago and gold-leaf do not bring out the fine

Inventor  
Thomas A. Edison  
By Dyer & Lecky



vibrations and produce rough reproductions while the silver salts do not run well on the wax surface. The vacuous deposit, however, adheres uniformly to the wax surface and reproduces the record with great perfection.

The invention is illustrated for convenience in connection with a cylindrical phonogram.

In the accompanying drawings, forming a part hereof, Figure 1 is an elevation of an original phonogram; Fig. 2, a cross-section of the original phonogram with a thin vacuous deposit thereon; Fig. 3, a view similar to Fig. 2, with a further backing; Fig. 4, a view the same as Fig. 3, with the original phonogram dissolved out; Fig. 5, a sectional view of the divided mold or matrix; Fig. 6, an elevation of a duplicate phonogram produced by the mold, and Fig. 7 a cross-section of such duplicate phonogram.

A is the original phonogram, having a relatively-soft wax or wax-like surface *a* and the backing of harder material *b*, or it may be entirely of wax. The phonographic record is produced upon the surface *a*. The metallic vacuous deposit is shown at *c*, and the further backing, preferably of metal, is shown at *d*.

B is the divided mold, produced as has been stated and having the phonographic record in relief.

C is the duplicate phonogram, produced by the mold and having a surface *e*, indented with the phonographic record and preferably of harder material than could be practically or satisfactorily indented directly by the phonograph.

My invention herein is limited to constructing the matrix or mold by covering the phonograph-record by a vacuous deposit.

The broad invention of duplicating phonograph-records and of producing matrices for that purpose, not limited to the use of the vacuous deposit as a step in the process of reproducing the phonographic record or constructing a matrix for that purpose, is not claimed herein, such broad subject-matter being covered by an application for patent filed

by me January 5, 1888, Serial No. 259,895, of which this specification is a division.

What I claim is—

1. The process of forming a matrix or mold for the duplication of phonographic records, consisting in covering the phonograph-record with a deposit of metal by vaporizing metal in a vacuum in which the record is placed, substantially as set forth.

2. The process of forming a matrix or mold for the duplication of phonographic records, consisting, first, in indenting the original record on a phonogram; second, covering the recording-surface of such phonogram with a deposit of metal by vaporizing metal in a vacuum in which such phonogram is placed, backing up such deposit to give it strength, and then removing the original phonogram, substantially as set forth.

3. The process of forming a matrix or mold for the duplication of phonographic records, consisting, first, in indenting the original record upon a phonogram having a wax-like surface; second, covering the recording-surface of such phonogram with a deposit of metal by vaporizing metal in a vacuum in which such phonogram is placed, backing up such deposit to give it strength, and then removing the original phonogram, substantially as set forth.

4. The process of duplicating phonograms carrying a phonographic record, consisting, first, in indenting the original record upon a phonogram; second, constructing a matrix or mold of such original record by depositing thereon a coating of metal by vaporizing metal in a vacuum in which the record is placed, and, third, producing duplicate phonograms from such matrix, substantially as set forth.

This specification signed and witnessed this 17th day of January, 1888.

THOS. A. EDISON.

Witnesses:

WILLIAM PELZER,  
E. C. ROWLAND.





(Specimens.)

2 Sheets—Sheet 1.

T. A. EDISON.

ART OF PLATING ONE MATERIAL WITH ANOTHER.

No. 526,147.

Patented Sept. 18, 1894.

Fig 1.

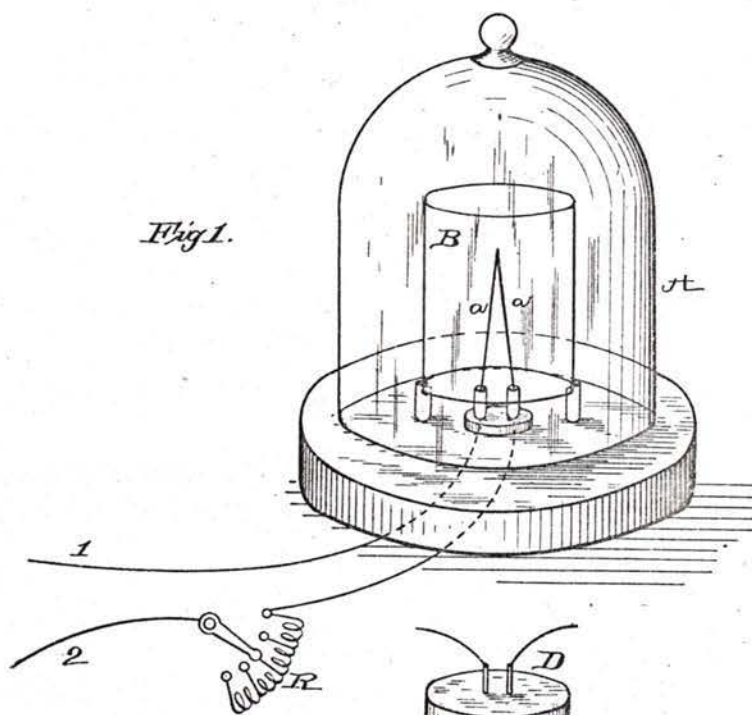
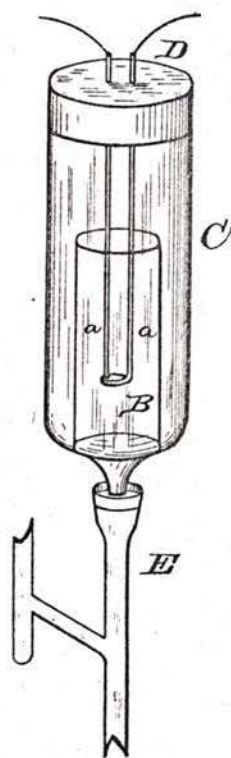


Fig 2.



WITNESSES:

*Ed. Rowland*  
*H. W. Lacey*

INVENTOR:

*Thomas A. Edison*  
*By Rich. A. Dyer,*  
*Att'y.*





(Specimens.)

2 Sheets—Sheet 2.

T. A. EDISON.

ART OF PLATING ONE MATERIAL WITH ANOTHER.

No. 526,147.

Patented Sept. 18, 1894.

Fig. 3.

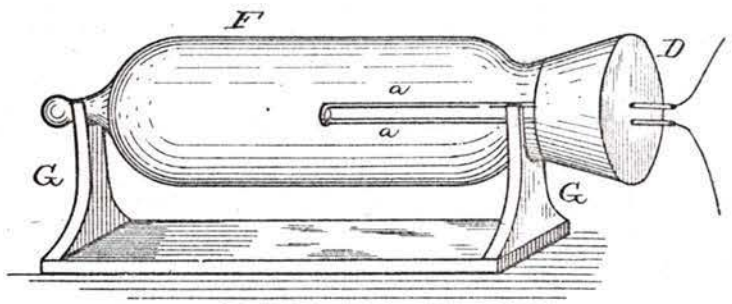


Fig. 4.

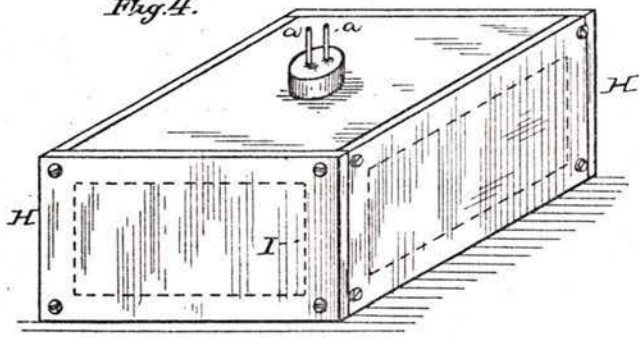


Fig. 5.

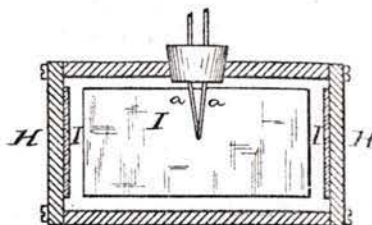
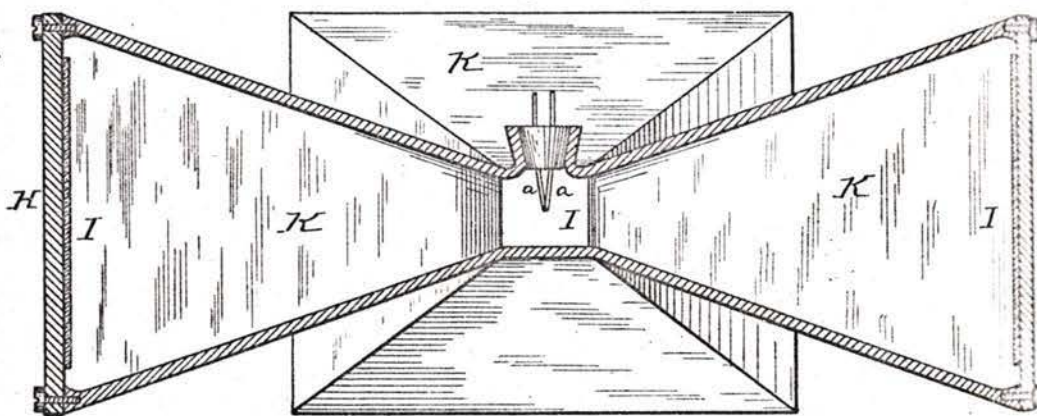


Fig. 6.



WITNESSES:

*Ed. Rowland*  
*H. W. L. L.*

INVENTOR:

*Thomas A. Edison*  
*By Rich. H. Dyer*  
*Att.*

UNI

ART

SPECIFIC

To all whom it  
Be it known  
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State of New J  
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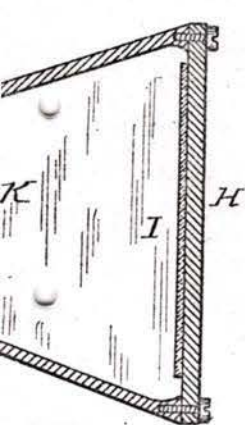
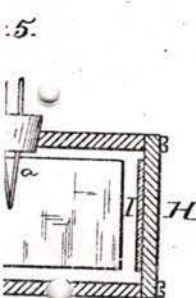
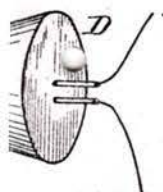
# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF MENLO PARK, NEW JERSEY.

## ART OF PLATING ONE MATERIAL WITH ANOTHER.

SPECIFICATION forming part of Letters Patent No. 526,147, dated September 18, 1894.

Application filed January 28, 1884. Serial No. 118,942. (Specimens.)



INVENTOR:  
T. A. Edison.  
Chas. H. Dyer,  
Att'y.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented a new and useful Improvement in the Art of Plating One Material with Another, (Case No. 615,) of which the following is a specification.

The object of this invention is to produce a coating of one material upon another; and said invention consists in producing such a coating by throwing the material to be deposited into the form of a vapor in a vacuum, by means of a continuous current, the object to be coated or plated being within the vacuum chamber so that the material is deposited upon it from the vapor.

I vaporize the material by electrical heating and the best method of doing this is to place electrodes of the depositing material in the vacuum chamber, forming a continuous arc between them. A dense even homogeneous and adherent deposit will then be rapidly formed upon the interior walls of the chamber and upon the surface of any object which may be placed within said chamber.

The deposit may be obtained by rendering the material to be deposited electrically incandescent within the vacuum by means of a continuous current, but the arc process is more rapid; also, I may produce a deposit of a non-conducting material by coating a conductor of carbon with such material and heating the same to incandescence. The material will be vaporized and deposited, while the carbon will withstand the heat. Any substance which will volatilize in the incandescent heat may be so used. This process of depositing in an exhausted chamber by electrical vaporization by means of a continuous current or a continuous arc, as distinguished from an intermittent current and from a series of sparks, I term electro vacuum deposition.

My invention is adapted to the plating of any material whether a conductor or non-conductor of electricity, while in the ordinary process of electro-deposition only conductors can be treated.

The uses of the invention are almost infinite, for coatings of any material and of any desired thickness may be formed. Metal

sheets so fine as to be transparent and yet even and homogeneous can readily be produced.

It is found especially advantageous in coating glass for mirrors as a very even deposit can be obtained in a very simple manner.

Alloys or compositions of different metals or substances may be produced by making each electrode of a different metal.

To produce a more rapid deposition two or more arcs may be formed in the chamber.

The invention may be applied to the manufacture of metallic foil especially gold, silver, and platinum foil. To accomplish this a cylinder of polished glass, coated internally with a film of material soluble in alcohol or water, such as shellac or gelatine, is placed in the exhausted chamber, and the arc is formed within said cylinder, upon the interior of which an even coating of the metal or alloy is formed, which can be stripped off in a homogeneous sheet, with the soluble material which is then dissolved off; or a very thin film of gold, silver or platinum may be formed upon a backing of cheaper material or upon both sides of a sheet of such material.

It is evident that the deposit may be made upon flat plates or upon objects of any form whatever; and by using screens of different forms to intercept portions of the deposit, which proceeds in straight lines from the arc, the deposit may be made in any pattern or design. The finest tracery of lace, for instance, may thus be accurately reproduced in any metal.

I may use an ordinary piston air-pump and form the arc and place the object to be plated, within the exhausted bell-jar or receiver thereof. The evenness of the deposit, however, increases with the degree of vacuum, and on this account it is often desirable to employ a Sprengel pump and by keeping the same continually in operation, constantly maintain the vacuum at the highest point.

To coat small articles, a number of them may be placed in an exhausted receiver, adapted to be rotated. The arc being formed and the receiver turned, the articles are coated evenly on all sides.

For coating mirrors, I cement the glass plates upon the inner side of the removable

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100



walls of an air tight box, which is exhausted and in which the arc is formed, a deposit being made upon the glass, which is then removed.

5 My invention is illustrated in the annexed drawings, in which—

Figure 1, illustrates the use of a piston air pump where the deposit is made on the interior of a glass cylinder. Fig. 2, represents a Sprengel vacuum pump used in the same way. Fig. 3, shows the rotating receiver for coating small articles. Fig. 4, is an elevation of a box for coating mirrors; Fig. 5, a section of the same; Fig. 6, a section of a form of box used for very large mirrors.

Referring first to Fig. 1, A is the exhausted bell-jar of an air pump and B is a hollow glass cylinder placed therein.

Electrodes *a, a*, of the desired metal are placed in the cylinder with their ends a little apart or very slightly in contact so that an arc is formed between them.

The circuit wires 1, 2, lead to the electrodes from any suitable source of continuous electric current whereby a continuous arc is produced between the electrodes.

An adjustable resistance R may be placed in the circuit to regulate the current.

The glass cylinder is internally coated with a soluble material such as shellac or gelatine. The deposit is rapidly and evenly formed on the interior of the cylinder, and is readily stripped off in homogeneous sheets, together with the soluble coating which may then be dissolved off.

In Fig. 2, a receiver C, hermetically closed by a rubber stopper D is placed in connection with the exhaust tube of a Sprengel pump E. The cylinder B is suitably supported in said receiver and the electrodes *a, a*, are inclosed by such cylinder. The operation of the pump being continued the highest vacuum is maintained throughout the whole process of deposition.

It is evident that any object which is to be plated may be substituted for the glass cylinder in the receiver or bell-jar.

In Fig. 3, a receiver F is shown, adapted to be rotated in supports G, G.

The electrodes *a, a* pass through the rubber stopper D. Any object or objects placed within the receiver will, when it is rotated, receive an even deposit. For instance, hooks and eyes, or small articles of jewelry may be readily plated in this way.

In Figs. 4 and 5, H, H, are the sides of the box, preferably of iron and removably secured together with air tight joints. Upon the inner sides are cemented plates of glass I, I, from which mirrors are to be made and which receive the deposit from the arc, formed by the electrodes *a, a*.

For very large plates of glass, the box shown in Fig. 6 is used, with compartments K, K, diverging from the center at which the arc is placed. The vaporous particles extend in straight lines in every direction from the

arc, and consequently deposit evenly upon the glass plates I, I. The box is then taken apart and the glass plates are removed. The deposit is so even that it may be made very thin, and the thin coating of silver backed up by zinc or other cheaper metal.

I am aware of experiments which have been made in which by the use of a high tension induction spark between electrodes in a vacuum it was found that a coating was produced in a vacuum chamber. This is merely a laboratory experiment and could not be practically applied because the formation of the deposit by the intermittent or alternating spark is too slow to be commercially useful. I have found that by using a continuous arc the process is made infinitely more rapid and certain, so that the useful results hereinbefore enumerated can be produced on a commercially practicable scale.

What I claim is—

1. The process of plating bodies with electrical conducting material, which consists in supporting the body to be plated in an exhausted chamber, supporting an electrode of the material to be deposited in said chamber, electrically vaporizing such metal in the chamber, and moving said body to bring different portions of it successively into proximity to the electrode of the material being deposited, substantially as described.

2. The process of plating bodies with electrical conducting material which consists in supporting the body to be plated in an exhausted chamber, supporting electrodes of the material to be deposited in said chamber, maintaining a continuous electric arc between said electrodes in the vacuum, and moving said body to bring different portions of it successively into proximity to the electrode or electrodes of the material being deposited, thereby coating the body evenly, substantially as described.

3. The process of plating bodies with an alloy or composition of electrical conducting materials, which consists in supporting the body to be coated in an exhausted chamber, supporting electrodes of different conducting materials in said chamber, and maintaining an arc between said dissimilar electrodes, substantially as described.

4. The process of making metallic foil, which consists in providing a suitable body in an exhausted chamber, and an electrical circuit extending within the same and including within the chamber a section of the metal to be made into foil, maintaining a continuous current in said circuit whereby metal is deposited on said body, and subsequently stripping off said deposited metal, substantially as described.

This specification signed and witnessed this 22d day of January, 1884.

THOS. A. EDISON.

Witnesses:

H. W. SEELY,  
EDWARD H. PYATT.





776

(No Model.)

H. J. LIORET.  
PHONOGRAPH.

4 Sheets—Sheet 1.

No. 528,273.

Patented Oct. 30, 1894.

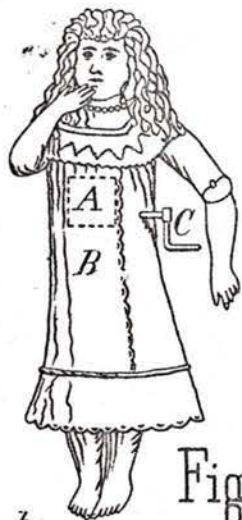


Fig. 1

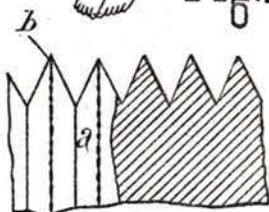


Fig. 4.

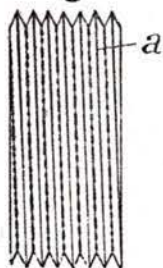


Fig. 8

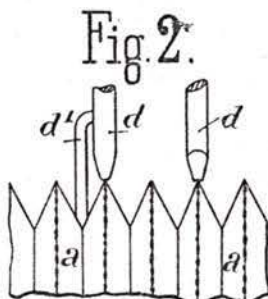
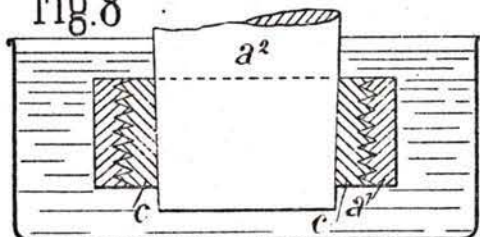


Fig. 2.



Fig. 5

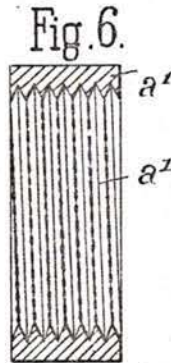


Fig. 6.

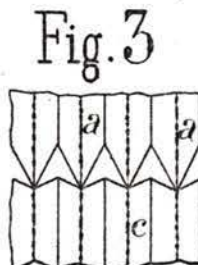


Fig. 3

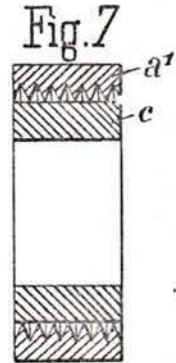


Fig. 7

Fig. 9.

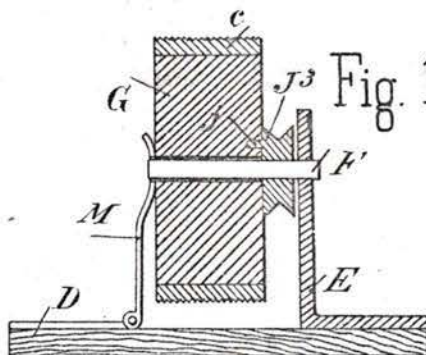
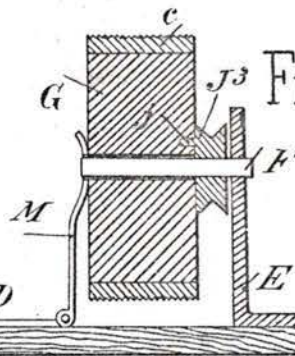


Fig. 10.



Witnesses:

Frederick Haynes  
George Barry

Inventor:  
Henri Jules Lioret  
by attorneys  
Brown & Seward





778 (No Model.)

H. J. LIORET.  
PHONOGRAPH.

4 Sheets—Sheet 2.

No. 528,273.

Patented Oct. 30, 1894.

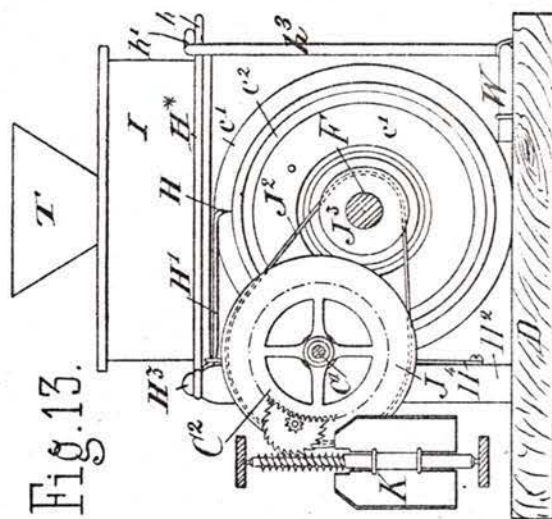


Fig. 13.

Fig. 11.

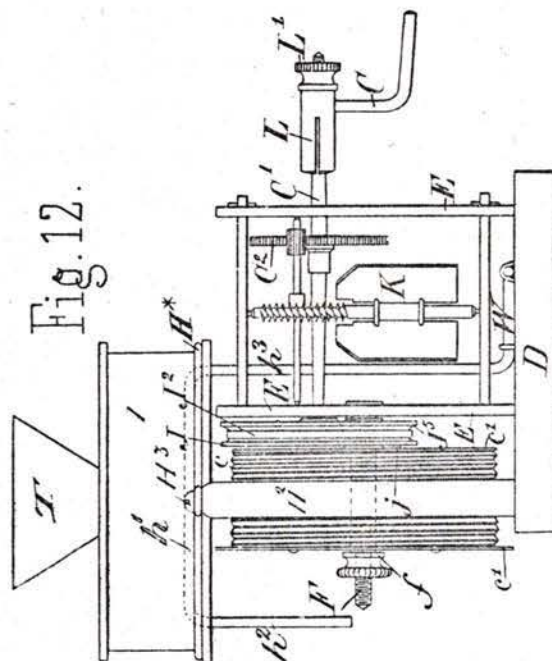
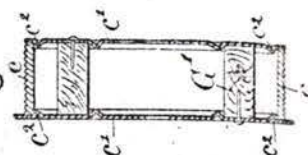
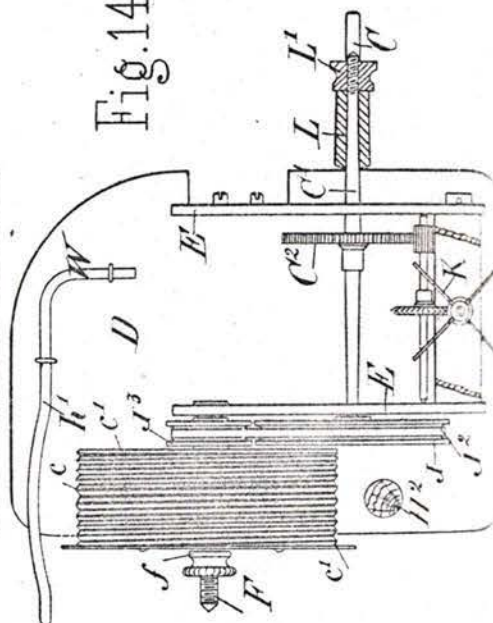


Fig. 12.

Fig. 14.



Witnesses:  
Two Humes  
George Barry.

Inventor:  
Henri Jules Lioret  
by attorney  
Rovet & Lewis





788  
(No Model.)

H. J. LIORET.  
PHONOGRAPH.

4 Sheets—Sheet 3.

No. 528,273.

Patented Oct. 30, 1894.

Fig. 15.

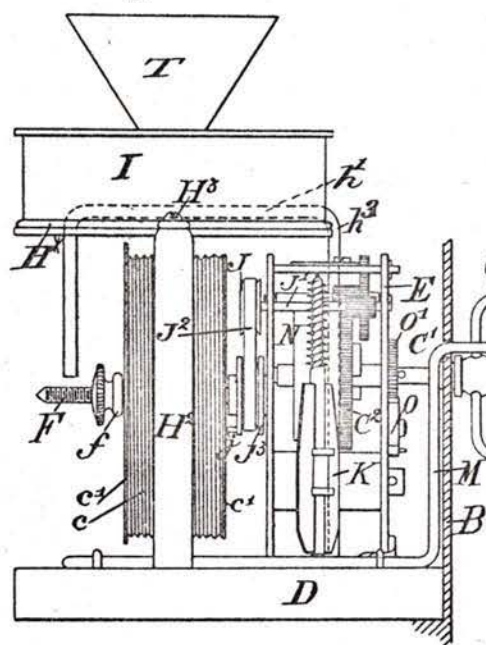


Fig. 16.

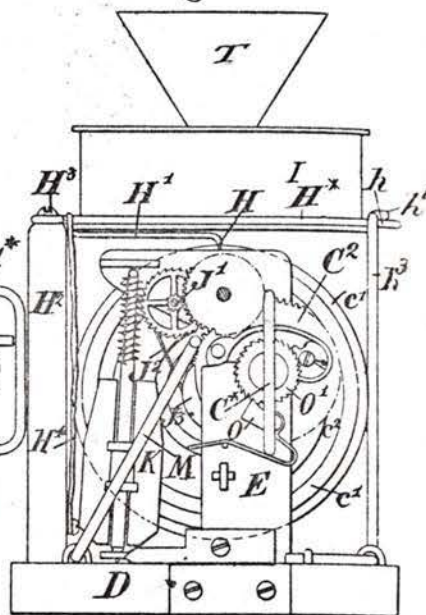
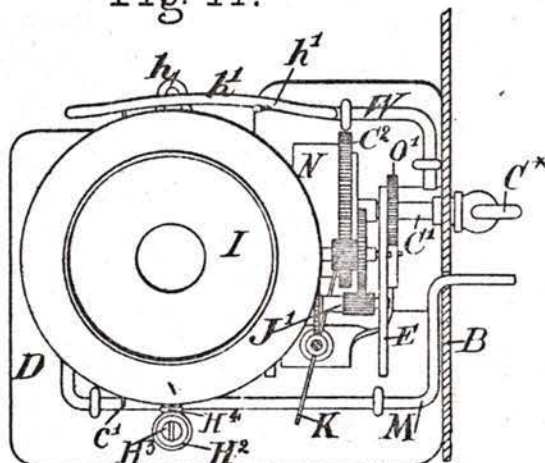


Fig. 17.



Witnesses:-  
Jno. T. Hayes  
George Barry.

Inventor:  
Henri Jules Lioret  
by attorney  
Edmund C. Lewis.





Fig. 18.

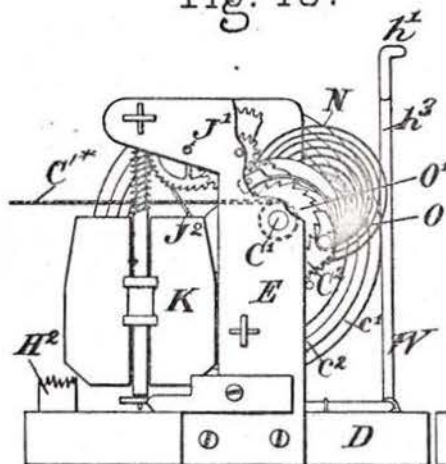


Fig. 19.

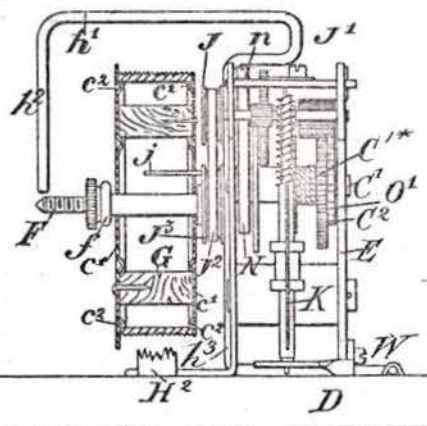
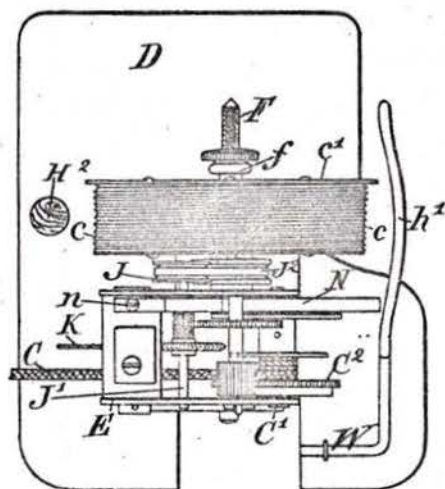


Fig. 20.



Witnesses:  
Fred W. Hays  
George Barry.

Inventor:  
Henri Jules Lioret  
by attorney  
Romaine & Co.

SPECIFIC  
Application of

To all whom  
Be it known  
of Paris, in the  
vented a new  
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brevet d'inve  
No. 230,177, d  
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## UNITED STATES PATENT OFFICE.

30, 1894.

HENRI JULES LIORET, OF PARIS, FRANCE.

## PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 528,273, dated October 30, 1894.

Application filed December 20, 1893. Serial No. 494,179. (No model.) Patented in France May 18, 1893, No. 230,177.

*To all whom it may concern:*

Be it known that I, HENRI JULES LIORET, of Paris, in the Republic of France, have invented a new and useful Improvement in Phonographs, (for which I have obtained a brevet d'invention of the Republic of France, No. 230,177, dated May 18, 1893,) of which the following is a specification.

The object of my invention is to construct phonographs at a low price and consequently to provide for their application to very numerous purposes, such for instance, as the manufacture of new toys.

My invention relates in the first place to the construction of the cylinder or roller intended to receive the impressions of the recording style which is carried by the vibrating plate, diaphragm or membrane which is spoken against, whereby the said cylinder, when engraved or impressed, may be used as a matrix to reproduce a great number of times the same impressions upon other cylinders which I call reproduction cylinders.

The improvement also relates to the mode of mounting or setting up these reproduction cylinders; also to the arrangement of the receiving style and of the resonant box or resonator to which the said style is adapted; and further to the motor mechanism of the phonographic apparatus.

In the accompanying drawings Figure 1 is a profile view of part of a matrix cylinder. Fig. 2 is a similar view showing the mode of guiding the style upon the fillets of the matrix cylinder. Fig. 3 is a similar view of part of the matrix cylinder and of the reproduction cylinder which may be obtained from it. Figs. 4 to 8 represent successive stages of the manufacture of a reproduction cylinder of celluloid and will be hereinafter more particularly described. Fig. 9 represents a doll furnished with my apparatus. Fig. 10 is a sectional view representing one way of mounting the cylinders of my system. Fig. 11 is a similar view showing another mode of mounting my cylinders. Figs. 12 and 13 represent elevations at right angles to each other, Fig. 13 being partly in section, of one example of a complete apparatus embodying my invention. Fig. 14 is a plan view partly in section, corresponding with Figs. 12 and 13. Figs. 15 and 16 represent elevations at right angles to

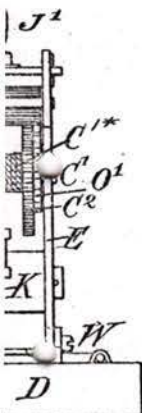
each other, Fig. 16 being partly in section, of a second example. Fig. 17 is a plan view corresponding with Figs. 15 and 16. Figs. 18 and 19 represent elevations at right angles to each other, Fig. 19 being partly in section, of a third example. Fig. 20 is a plan view corresponding with Figs. 18 and 19.

Similar letters of reference designate corresponding parts in all the figures.

The matrix cylinders are obtained in the following manner: I take a sleeve or hollow cylinder of soft steel having on its outer circumference a thread with triangular cross-section of suitable fineness and place it in front of the recording style attached to the vibrating plate or diaphragm which is spoken against, so arranging the said sleeve and style that the point of the style engraves its impressions successively along the top angle of the thread; this being where the resistance to penetrate is the least, first because of the slight thickness of metal presented and second, by reason of the absence of lateral contact or friction due to contiguous surfaces because such surfaces do not exist in the neighborhood of the top angle of the thread; where the style may act with more efficacy and cut in a suitable manner in the sharp edge the impressions which are to be left upon the cylinder.

To receive the impression of the sonorous vibrations the threaded sleeve or cylinder is keyed upon an arbor which is terminated by a screw of the same pitch engaged in a nut. In front of the cylinder or sleeve thus mounted I arrange any appropriate phonographic recording apparatus—for example a vibrating membrane furnished with a style, taking care that the style bears upon the angle of the thread of the cylinder. If then the arbor is set in motion, the cylinder turns in front of the style and if one speaks against the membrane the style will engrave along the angle of the thread impressions of form and depth corresponding with the nature of the sonorous vibration. The cylinder being thus engraved I temper it and thus obtain a cylinder which may be employed to produce the vibration of the membrane of the receiver and reproduce sounds which have been made in front of it.

The first part of my invention is indicated



Inventor:  
Jules Lioret  
by attorneys  
Wm. H. Howard



in Fig. 1 which represents an elevation and section of portions of the threaded cylinder showing the impressions *b* cut in the angle of its thread by the recording style.

5 When the matrix cylinder *a* is employed directly to make the receiver speak, the receiving style *d*, of which the blunt point should rest upon the angle of the thread as shown toward the left of Fig. 2, bears upon  
10 an additional lateral point *d'*, which is engaged in the groove of the thread in such manner as to be guided by it and to produce naturally the advance both of itself and of the receiving style without which there would  
15 be necessary for the latter a screw or other mechanism of some kind or other corresponding with the thread of the cylinder. There might also be employed a style with a point broadened and hollow in the form of a crescent in such manner as to embrace the angle  
20 of the thread and yet only rest upon it by a point as shown toward the right hand of Fig. 2. It has been mentioned how the cylinder engraved upon the angles of its thread and then tempered may be employed directly to produce the speech of the receiver; its great  
25 hardness assuring it the advantage, quite new, of great durability; but it may also, as I have said, serve as a matrix or as a rowel utilizable to produce directly a great number  
30 of times and consequently in a very economical way upon other cylinders of soft metal or other suitable material, impressions which will enable them to be used to put in vibration the membrane of the receiver. These are the new cylinders which I have designated under the name of reproduction cylinders.

When it is desired to obtain a cylinder of  
40 soft metal or other analogous material it may be done directly by simply causing the matrix to roll under a suitable pressure upon a cylinder of the same diameter in such manner as shown in Fig. 3, or else upon a ribbon  
45 of suitable profile which may be afterward enrolled upon a roller. The reproduction cylinder has preferably a thread of the same pitch as that of the matrix cylinder in order that the impressions engraved upon the angle  
50 or top of the thread of the latter may be reproduced in the bottom of the thread of the reproduction cylinder as shown in Fig. 3. The ribbon may also present striations or grooves which, when it is enrolled upon its roller,  
55 will constitute a threading. In this case the impressions are also reproduced at the bottom of these striations or grooves. In fact these impressions will be counterparts of those of the matrix cylinder, but that is without importance from the point of view of the reproduction of the sounds.

It is hardly necessary to remark that when use is made in the receiver of the reproduction cylinder *c* like that which has just been  
65 described, the receiver style may be guided very simply by making its point bear on the bottom of the cavity of the thread.

It may be remarked (see Fig. 3) that the threading of the reproduction cylinder *c* is not so deep as that of the matrix cylinder *a* in order to facilitate the reproduction. This  
70 threading only needs to be deep enough for the guidance of the style.

When the reproduction cylinders are not required to be so durable, instead of making them of soft metal or other analogous matter, they may be made of celluloid. This material presents the advantage of well preserving the impressions, not being liable to break  
75 and above all not being sensibly influenced by atmospheric variations. Moreover, besides being homogeneous and very hard, they cut and mold sharply and they wear well.

To produce the cylinders of celluloid, I operate as follows: I prepare the matrix cylinder *a* (Fig. 4) as I have hereinbefore described. Then I take upon it as is shown in  
80 Fig. 5, a galvano-plastic mold *a'* which presents consequently the form of a tube having in its internal surface the counterpart of the threading and the impressions of the matrix cylinder *a*. (See Fig. 6.) I remove this tube from the matrix cylinder by first heating it externally to expand it sufficiently  
85 to enable it to be unscrewed from the said cylinder, the impression being so slight that very little expansion is necessary. After its removal I introduce into the said tube a sleeve or ring *c* of celluloid (see Fig. 7) just large enough to enter it freely, then plunge the whole into hot water. The celluloid is thus softened, and I then introduce forcibly  
90 into the said collar or ring *c* a mandrel *a''* sufficiently large to dilate the said ring or collar and cause it to penetrate into all the cavities of the mold *a'* as shown in Fig. 8. I then plunge the whole into cold water and the celluloid recovers its hardness and is at the same time generally contracted sufficiently to permit the easy withdrawal of the ring *c* from the mold *a'* by unscrewing it therefrom. If, however, the contraction of the ring *c* in this way is not sufficiently greater than that of the mold *a'*, the mold may be slightly warmed by heat externally applied.

It may be here mentioned that the impression produced by the style on the matrix cylinder and reproduced in reverse in the mold *a'* is so slight that only a very slight dilation of the ring *c* is necessary to obtain the impression on it and a very slight contraction to permit it to be unscrewed from the mold *a'* without damaging said impression.

It may be further mentioned that the threads of the matrix are very fine in practice and are very much exaggerated in the drawings to facilitate the illustration. This ring *c* thus becomes finally a reproduction cylinder which is an exact reconstitution of the matrix cylinder *a*. This method is rapid and economical and gives perfect results. It may be understood moreover that according as the impressions have been engraved upon the angle or in the bottom of

the thread will also be the recording style or the receiver style. In the my invention arranged as shown in Fig. 9, the hole in the drive the M serve in place of the celluloid as is shown it between and having on their maintain the wooden The cylinder the arbor which fits As to the index c, it is characterized that the driving between an elastic vice. It transmits the drive J on hereinbefore advantage elastic slip a altogether considered wheel to in the specially if In my style H of a horizontal spindle suitable under the arm H is tried by a free to turn by the upon the follow a



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the thread of the matrix *a*, the cylinder *c* will also have the impressions upon the angle or in the bottom of its thread and that the receiver style should be formed to correspond.

In the following description of examples of my invention I will suppose the phonograph arranged in the body of a doll as shown in Fig. 9, but it will be understood that it is capable of any other application.

For whatever purpose they are to be applied the cylinders *c* obtained by either of the means which I have just described may be fastened upon a cylindrical drum *G*, made of wood for example, which is fitted to turn freely upon a fixed arbor *F*. This arbor is carried by a standard *E* fixed upon a base *D* as shown in Fig. 10. It also receives a loose pulley *J* carrying a pin *j* which enters into a hole in the drum *G* in such manner as to drive the cylinder *c*. A hinged spring arm *M* serves to hold the drum *G* and cylinder *c* in place upon the arbor but permits their removal therefrom. When the cylinder *c* is of celluloid I prefer to mount it in another way as is shown in Fig. 11, that is to say, to place it between two thin disks *c'* forming jaws and having annular centering projections *c''* on their inner faces. These two disks are maintained at a suitable distance apart by a wooden ring *G'* to which they are nailed. The cylinder *c* thus mounted is placed upon the arbor *F*, the disks *c'* having central holes which fit the said arbor.

As to the mechanism for driving the cylinder *c*, it may be varied in many ways, but it is characterized in all cases by the fact that the motive power is not applied directly to the arbor *F* of the said cylinder *c*, but to a driving spindle *C'* (see Figs. 12 to 20) between which and the said cylinder there is an elastic or yielding power-transmitting device. In the example represented this power-transmitting device consists of an india rubber driving-belt *J* running on a driving pulley *J* on the spindle *C'* and on the pulley *J* hereinbefore mentioned. The principal advantage of this method of driving is that the elastic belt may allow the driving pulley *J* to slip a certain distance without letting it go altogether when the cylinder *c*, which has a considerable relative weight, acts as a fly-wheel to remedy any inevitable inequalities in the speed of the driving spindle *C'*, especially if it is moved by hand.

In my apparatus the blunt pointed receiver style *H* is affixed to or formed by the extremity of a horizontal arm *H'* which carries a cylindrical resonance box or resonator *I* of any suitable material, the style being rigidly fixed under the center of this resonator. The said arm *H'* is mounted freely upon a pivot *H<sup>2</sup>* carried by a column *H<sup>3</sup>* in such manner that while free to turn on this pivot the ensemble formed by the resonator and the style rests freely upon the cylinder by its own weight and may follow a generatrix of the cylinder in the

threading of which the style is always guided as has been previously described. For greater simplicity, the style, the arm which carries it, and the support for the box may be constituted as shown in the drawings, by one and the same metal wire, preferably of steel, which surrounds the base of the resonator, as shown at *H\**, forms an eye around the pivot *H<sup>2</sup>* and passes under the base of the resonator to form the arm *H'* the extremity of which is bent down and pointed in such manner as to constitute the style *H*.

As to the column *H<sup>2</sup>*, it is simply placed tightly in a hole in the base *D*. In order to insure a better contact between the style and the cylinder, the metal wire which carries the resonator and which forms the style is constantly pulled downward by a spring of any suitable kind as an elastic band *H<sup>4</sup>*, of which one of the ends is attached to a fixed point. Moreover, the metal wire has formed in it a loop *h* which projects from the resonator and constitutes a guiding arm and which, being guided under a suitably arranged guide *h'*, prevents the resonator *I* and the style *H* from being accidentally separated from the cylinder beyond a certain distance, when the apparatus receives a shock for example. The said guide *h'* is represented as formed by the horizontal upper portion of a fixed yoke *W* made of strong wire and fastened to the base *D*, which yoke has also two vertical branches *h<sup>2</sup>* and *h<sup>3</sup>*. When the resonator in turning about the pivot *H<sup>2</sup>* arrives at the end of its course in one direction or the other, that is to say, when the style has run the entire length of the cylinder, its guiding arm *h* encounters one of the vertical branches *h<sup>2</sup>* *h<sup>3</sup>* of the yoke and prevents the resonator and the style from running any farther. On the other hand, when the apparatus is reversed, the guiding arm *h* coming against the guide *h'* prevents the resonator from being too far separated from the cylinder. Were it not for this guide all the weight of the resonator would be thrown back upon the loop which forms the eye around the pivot *H<sup>2</sup>* at the bending of said loop, thereby disarranging the said apparatus.

The resonator has preferably an opening in its top to receive the end of a trumpet *T* which facilitates the proper propagation of the sound.

When the cylinder is turned in the proper direction to make the apparatus speak, the style follows freely the thread of the cylinder, and when it has arrived at the extremity of the cylinder all that has to be done is to shift it to the other end to make the apparatus repeat its speech.

The phonographic apparatus thus set up may be driven by hand or else by the aid of a clock mechanism. In the apparatus represented in Figs. 12 to 14, the movement is produced by the turning of a hand-crank *C*. This crank, instead of being keyed upon the spindle *C'*, is carried by a split socket *L*



mounted upon a slightly conical portion of the spindle C'. A nut L' screwed on to the end of the said spindle serves to regulate the tightness and the adhesion between the socket and the spindle.

The spindle C' has geared with it and drives a fly regulator K. The resistance presented by the air to the movement of this fly increases with the speed of the latter, but there is one speed of rotation of the crank C and spindle C' at which this resistance is equal to the adhesive force of the socket L on the spindle C'. If this limitation of speed is passed the resistance opposed to the driving mechanism by the fly K becomes superior to the force of adhesion of the socket L and the latter slides upon the spindle C' which preserves always a constant speed limited to the desired degree.

In the example represented in Figs. 15 to 17 the drum G and cylinder c are driven by a spring clock mechanism which is wound by means of a key C\*. In this example the fly regulator K is applied as in the example previously described.

I employ very simple means of starting and stopping the clock movement. This means consists of a movable stop M mounted upon the base D in such manner as to be capable of sliding forward and backward when manipulated by means of a prolongation m suitably guided. When, after the winding, this stop M has been brought to the position indicated in the drawings, the clock movement is permitted to operate because the fly K is allowed to turn freely without encountering the said stop; but on the other hand, the winding is impossible because the key in turning would be arrested by the prolongation m of the stop. If on the contrary, the latter is pushed inward the winding becomes possible but the movement is stopped because the fly in turning would encounter the stop and be thereby stopped.

In the example represented in Figs. 18 to 20 the mechanism is simplified by substituting for the clock movement a simple spring N of which one of the extremities is attached to the fixed pin n and the other is attached to the motor spindle C'. To produce the winding, all that it is necessary to do is to draw a small cord C'\* which is enrolled upon a drum keyed upon the spindle C'. The spindle is thus made to turn in the desired direction to wind the spring N. During this movement the transmitting mechanism does not turn because the gear C<sup>2</sup> is loose upon the spindle C' and the pawl O which is carried by the said gear may slip over the teeth of the ratchet wheel O' keyed upon the said spindle; but when the cord C'\* is let go, the spring tends to produce the turning of the spindle C' in a reverse direction. The ratchet wheel O' then drives the gear C<sup>2</sup> and consequently sets in movement all the transmitting mechanism.

The speed of this movement is also regulated by the fly K.

I have supposed in the example represented as I have hereinabove stated, that the phonographic apparatus was placed in the cavity A provided in the body B of a doll (Fig. 10). It is then arranged in such manner that one may from the exterior operate the crank C or wind the clock movement by means of the key C\* or the cord C'\*.

One or more of the walls of the cavity A should be very thin and also pierced with holes in order that there may be no obstacle to the propagation of the sound.

What I claim as my invention is—

1. In a phonograph, the combination with a spirally threaded cylinder, a style d having a point which runs on the top of the thread of the said cylinder and an additional guiding point d' engaging in the groove of said thread, substantially in the manner and for the purpose herein described.

2. In a phonograph, the combination with a threaded cylinder and a resonator turning about a fixed pivot and furnished with a style to follow the threading of the cylinder, of a guiding yoke comprising a horizontal portion and vertical branches, and a guiding arm carried by the resonator and engaging under the horizontal portion of said yoke, substantially as and for the purpose herein described.

3. The method of reproducing phonographic cylinders which consists in first obtaining a metal mold by electro-deposit upon an original phonographic cylinder, next placing bodily within the so obtained mold a solid ring of plastic material capable of being softened by heat, next softening this ring by heat, and finally so distending the said ring within said mold by internal pressure that it will receive therefrom an impression corresponding with that of the original cylinder, substantially as herein described.

4. The combination in a phonographic cylinder, of a hollow cylinder c, disks c' having centering projections for said hollow cylinder and a spacing ring G' arranged between said disks and means of securing said disks to said spacing ring, substantially as herein described.

5. The combination with a motor for operating a phonograph, of a driving crank on the main spindle of said motor, an adjustable friction device between said crank and spindle and a rotary fly geared with and driven by said motor, substantially as and for the purpose herein set forth.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HENRI JULES LIORÉ.

Witnesses:

MAURICE MERCIER,  
CLYDE SHROPSHIRE.





No. 645,920.

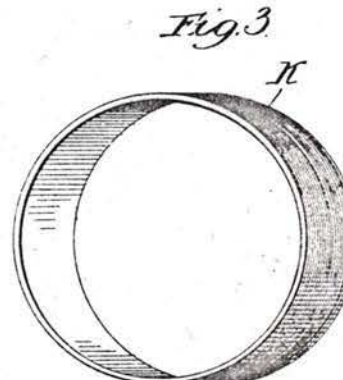
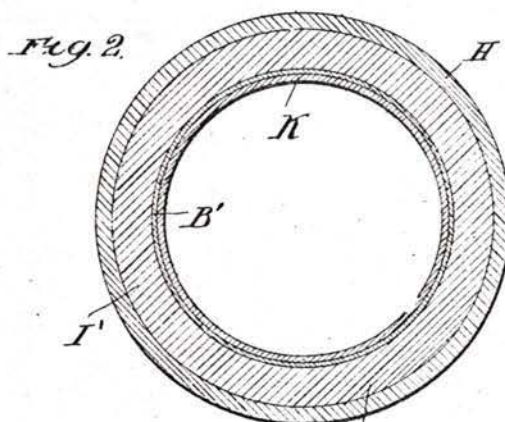
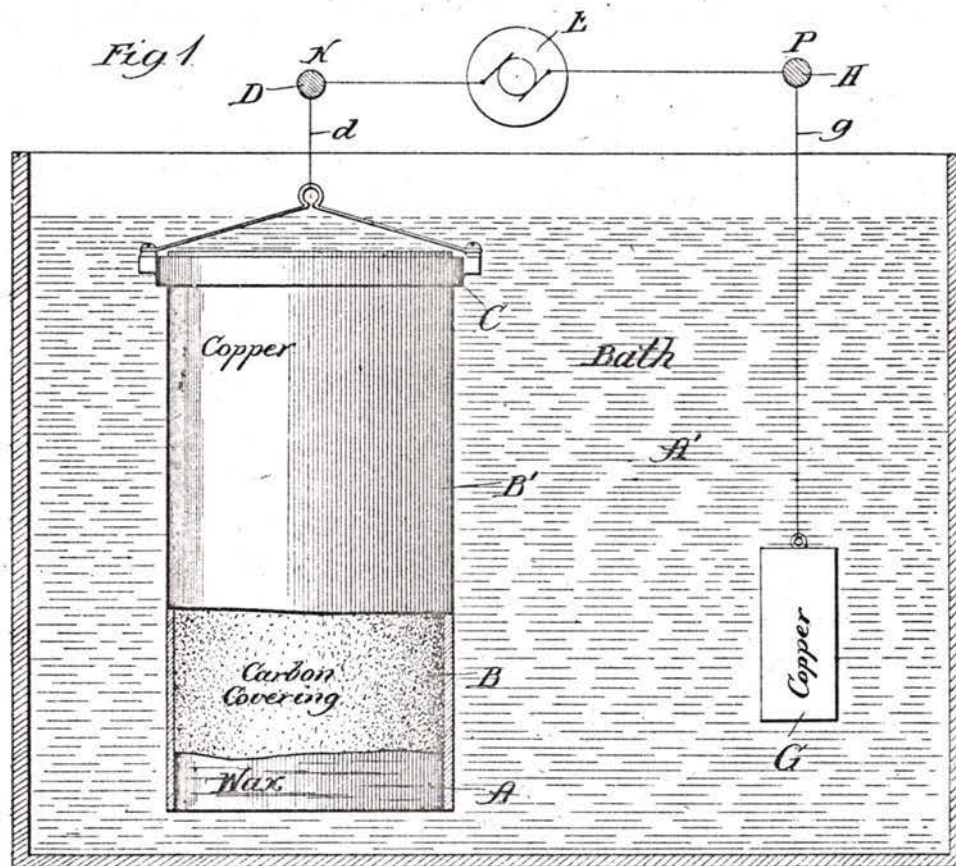
T. B. LAMBERT.

Patented Mar. 20, 1900.

METHOD OF REPRODUCING PHONOGRAPH RECORDS.

(Application filed Aug. 14, 1899.)

(No Model.)



Witnesses:  
*Lute S. Plon*  
*Thomas B. McGregor*

Inventor.  
*Thomas B. Lambert,*  
 By *Banning & Banning & Sheriden*  
*Attys.*

THOMAS B. LAMBERT  
 TO  
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placed within the cylindrical opening of the matrix and by means of an expansive pressure with heat forced outwardly, completely filling the matrix and against the inner surface thereof, thus making a counterpart of the same and a record similar to that on the original wax cylinder. The ring thus formed, having on its outer face a faithful imprint of the matrix, is then allowed to harden, either naturally or by artificially curing the substance thereof, through which hardening it shrinks sufficiently to enable its subsequent removal to be made from the matrix without injury to either. As a shrinking or reducing medium I have used a solution of hydrochlorous acid and water in which the tube and matrix are placed, as above, so that the tube can be removed from its engagement with the matrix. When it has become dried and hardened, it forms a cylinder K, as shown in perspective view in Fig. 3, preferably of cellulose, and which is practically infrangible. I prefer to use cellulose for this purpose in that it is easier to manufacture and more durable in operation, though the same method may be used for forming cylinders of different materials.

In carrying out my process it is an absolute requirement that the blank phonograms or tubes must be of a thickness to receive and retain in a perfect form the indentations of the matrix and at the same time have within itself a sufficient backing or support for the reproduction of the record phonographically after the formation of the record on its face and the removal of the tube from the matrix. It is practically impossible to use very thin walled tubes or hollow cylinders for my process, because the phonographic reproduction of sound from such thin records, supposing the tubes to be capable of even temporarily maintaining or holding their shape, would be weak, distorted, indistinct, and imperfect; but as a matter of fact the records themselves made of thin material are not capable of retaining their shape and would be impractical in actual use. By using a relatively-thick-walled tube or hollow cylinder the objections which would occur in practice with a very thin tube are entirely overcome and the produced records are a merchantable article. It is to be understood that in applying pressure

to the interior of the tube or cylinder for forcing the same outwardly and against the face of the matrix such pressure must be simultaneously exerted over the entire surface of the tube or cylinder and in a uniform manner, so as to simultaneously force the entire exterior surface against the interior face of the matrix, for if otherwise there would be great danger and liability of a flow of material and a consequent distortion therefrom, producing an imperfect record.

I claim—

1. The method of producing record-cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively-soft material, rendering the surface of the wax cylinder electrically conductive and electrolytically depositing metal thereon, forming a matrix and then outwardly expanding under pressure within the matrix, a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix and finally removing the cylinder or tube by direct longitudinal movement, substantially as described.

2. The method of producing record-cylinders for phonographs which consists in first forming a record on a cylinder of relatively-soft material such as wax, then coating such cylinder with carbon or other electric conducting material, and electrolytically depositing metal thereon forming a matrix, then shrinking the soft cylinder to remove the electrically-formed matrix and backing such matrix to form a matrix-mold, then outwardly expanding under pressure a cylinder or tube sufficiently thick to maintain its shape after disengagement from the matrix and of softened material such as cellulose, within the matrix for the pressure to reproduce on the outer surface the counterpart of the indentations in the matrix, then allowing such cellulose cylinder or tube to harden within the matrix and removing the record cylinder or tube from the matrix and then drying and hardening the record-cylinder, substantially as described.

THOMAS B. LAM. ERT.

Witnesses:

THOMAS F. SHERIDAN,  
ALBERT D. PHILPOT.





No. 657,956.

Patented Sept. 18, 1900.

A. N. PETIT.  
GRAPHOPHONE CYLINDER.

(Application filed Nov. 15, 1899.)

(No Model.)

Fig. 1.

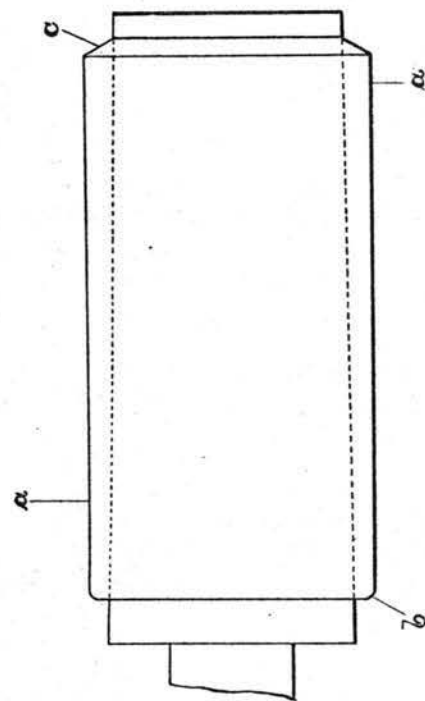
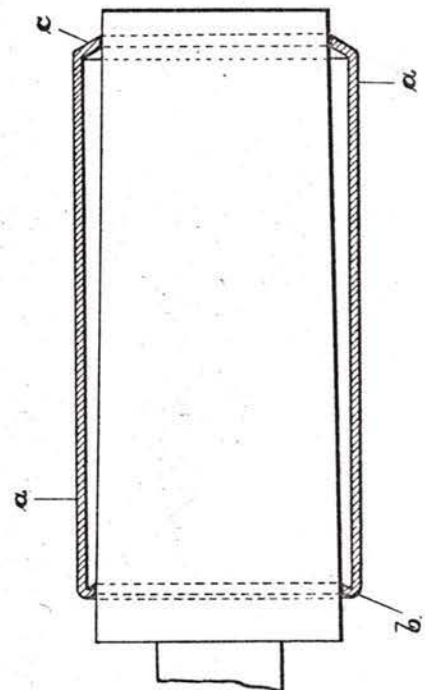


Fig. 2.



Witnesses  
L. W. Lurrell  
Charles Smith

Inventor  
A. N. Petit  
per  
L. W. Lurrell & Son  
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# UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY.

## GRAPHOPHONE-CYLINDER.

SPECIFICATION forming part of Letters Patent No. 657,956, dated September 19, 1900.

Application filed November 15, 1899. Serial No. 737,016. (No model.)

*To all whom it may concern:*

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Record-Cylinders for Phonographs, Graphophones, and Similar Instruments, of which the following is a specification.

As heretofore constructed, records or cylinders for phonographs, graphophones, and similar machines have been made from a preparation of wax or similar material. These records have been of considerable thickness and appreciable weight. They have been made with a taper opening through the center to receive and fit upon the taper mandrel of the machine. These records have been of a delicate nature, because they were easily broken and the surface was readily marred or disfigured if accidentally brought in contact with any harder substance. Consequently they had to be very carefully handled, and special devices have been made for receiving, storing, and carrying the said records from place to place.

The object of my invention is to overcome these difficulties.

My invention is a new article of manufacture; and it consists of a cylinder or record of celluloid in which the respective ends are bent inward, so as to leave the opening of a diameter to fit upon the taper mandrel of the machine, and which openings at the ends of the cylinder are of less diameter than the interior diameter of the cylinder. These cylinders are light and strong and the surface is hard and they do not have to be handled with any particular care, and special devices do not have to be provided for storing or carrying about the same.

In the drawings, Figure 1 is an elevation of a cylinder upon the mandrel, and Fig. 2 is an elevation of the mandrel and longitudinal section of the cylinder or record.

The cylinder or record *a* is formed from a tube of celluloid or similar material of an external diameter agreeing with the diameter of the cylinders or records already in use and upon the market. The tube is of sufficient thickness for strength, but is withal exceedingly light, and the interior diameter is somewhat greater than the diameter of the man-

drel at any point. In order that the tube may fit upon the taper mandrels in use and be concentric therewith, the respective ends are softened and are bent inward. The end *b* is inwardly curved and of the greatest diameter, and the end *c* is bent inward in a tapering form, preferably, and is of the lesser diameter. I prefer to bend the ends in such a manner that the cylinder or record so formed slips readily upon the mandrel of the phonograph, graphophone, or other machine and when in place is held with sufficient friction to prevent any possibility of the cylinder or record slipping on the mandrel. The cylinder or record is produced of one piece of material, the ends being integral and bent inward, preferably of the form shown in the longitudinal section. These cylinders possess lightness and strength and are comparatively inexpensive, and they are not readily broken, and there is a great saving in weight over and above cylinders of ordinary construction.

In my application for Letters Patent, Serial No. 734,933, filed October 27, 1899, I have described the method of and materials for treating the surface of cylinders or record-blanks of this character, so that the record may be impressed upon the surface of the cylinder in the same manner as the record is impressed upon the wax surface of the ordinary cylinder.

I claim as my invention—

1. As a new article of manufacture, a cylinder or record for phonographs, graphophones or similar machines, formed from a tube with the ends integral and bent inward and provided with openings of different diameters, so that they fit upon the taper mandrel of the machine, substantially set forth.

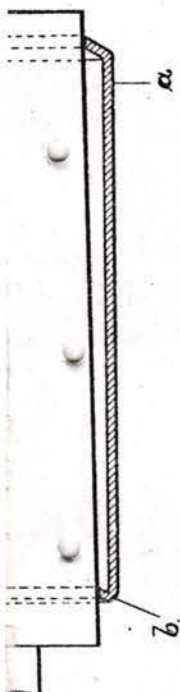
2. As a new article of manufacture, a cylinder or record for phonographs, graphophones or similar machines of celluloid and formed from a tube with the ends integral and bent inward and provided with openings of different diameters so that they fit upon the taper mandrel of the machine, substantially as set forth.

Signed by me this 13th day of November, 1899.

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,  
E. E. POHER.



ntor  
A. Petit.  
Russell L. Son  
Att'ys.









796

No. 667,662.

Patented Feb. 5, 1901.

T. A. EDISON.

PROCESS OF DUPLICATING PHONOGRAPH RECORDS.

(Application filed May 8, 1900.)

(No Model.)

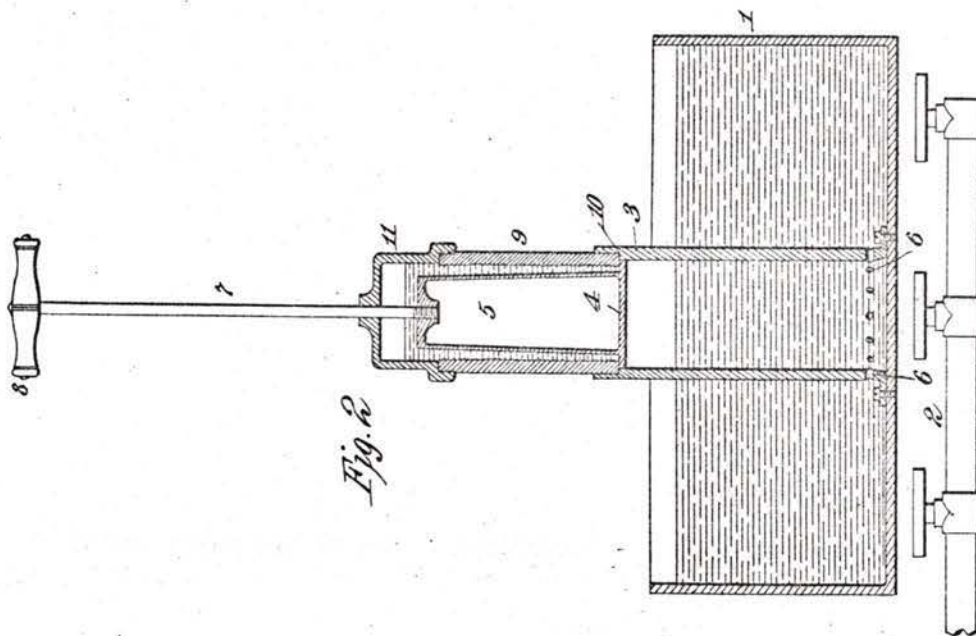


Fig. 2

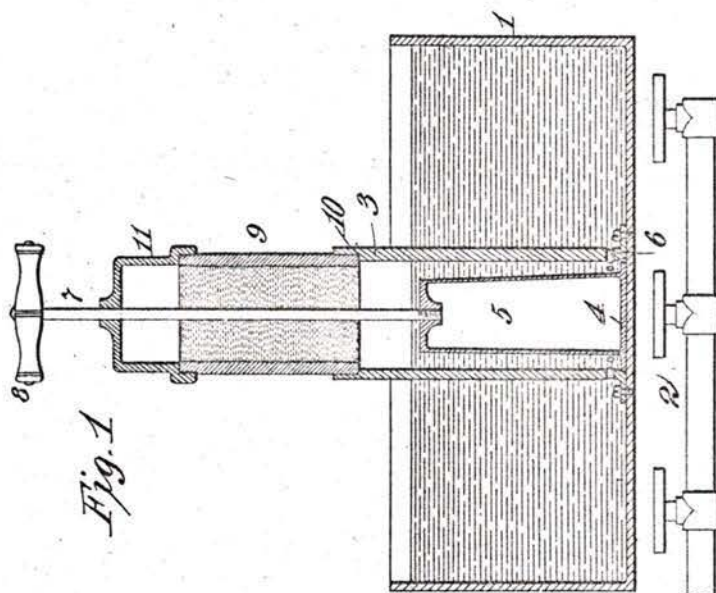


Fig. 1

Witnesses:

*Geo. F. Coleman*  
*Wm. R. Taylor*

Inventor

*Thomas A. Edison*

by *Spencer Edmunds*

Att'ys.

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# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

## PROCESS OF DUPLICATING PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 667,662, dated February 5, 1901.

Application filed May 8, 1900. Serial No. 15,874. (No specimens.)

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, county of Essex, and State of New Jersey, have invented a certain new and useful Improved Process of Duplicating Phonograph-Records, (No. 1,036,) of which the following is a specification.

My invention relates to an improved process for duplicating phonograph-records, and the process is of the character covered by my Patent No. 484,582, of October 18, 1892, wherein a matrix of an original record is employed as a mold for the making of the duplicates. In the specific process described in my previous patent the matrix secured from the original record is divided longitudinally, so as to form a sectional mold in which are cast the desired duplicates. My present invention is designed specifically as an improvement on said process, and my object is to provide a process wherein the production of the duplicate records will be facilitated and wherein the character of the resulting duplicates will be improved, since the mold used is continuous on its bore.

My present process depends upon the fact that after molten metallic soap or a mixture of soaps or other suitable material has been introduced within a mold carrying the representation of a phonographic record in relief on its bore and allowed to set a sufficient contraction of the resulting duplicate can be secured as to permit of a longitudinal separation of the duplicate from the mold, whereby a continuous mold can be employed for the carrying on of the process.

In order that my invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional view of a suitable apparatus for the purpose, illustrating the plunger and piston in their lowermost position; and Fig. 2, a similar view showing the same parts in their elevated positions.

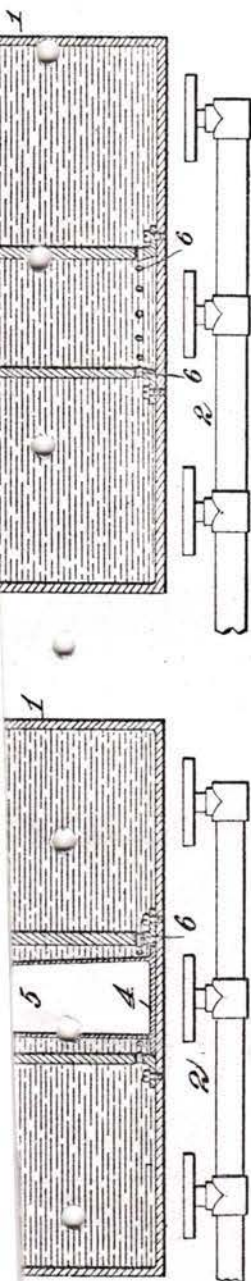
In both the above views corresponding parts are represented by the same numerals of reference.

The apparatus illustrated in the figures is designed for the duplicating of cylindrical phonographic records, and it will be so de-

scribed; but the applicability of my process for the duplication of other varieties of records will be apparent to those skilled in the art.

In the drawings, 1 represents a suitable jar or tank of the proper dimensions and made of any desired material. Within the jar or tank 1 I place the material of which the duplicate records are to be formed and which may be maintained in a molten condition by the application of heat in any way—as, for example, by a gas-tube 2, supplying a number of jets, as shown. The proper level of the molten material is indicated, and this level should be approximately maintained by the addition of fresh material from time to time within the tank as the liquid material may be withdrawn during the operation. The material in the tank 1 and of which the duplicate records are to be formed may be of any suitable character; but preferably it is a metallic soap or a combination of several soaps to which has been added a material not affected by water, such as ceresin, whereby the resulting duplicates will be protected from the effects of atmospheric moisture. Mounted within the tank and secured to its bottom is an open-ended cylinder 3, in which works a piston 4. A tapered core 5 is connected to or formed integrally with the piston 4, and said core is preferably hollow, so as to present a thin wall to the material, whereby the core will very quickly reach the temperature of the molten material when it is immersed therein. A number of openings 6 are formed in the cylinder 3, near the bottom thereof, below which openings the piston 4 passes in reaching its downward position, as shown in Fig. 1, whereby the liquid material may flow through said openings into the cylinder above the piston. Connected to the core 5 is a plunger 7, having an operating-handle 8. The connection between the core and plunger is such as will permit a separation of these parts, ordinary screw-threads being shown.

9 represents a mold which rests within a shoulder 10, formed at the top of the cylinder, and which mold carries on its bore the representation in negative or relief of a phonograph-record which it is desired to duplicate. This mold is preferably obtained by



Inventor

T. A. Edison

Att'ys.

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the process described in my application for Letters Patent filed March 5, 1898, Serial No. 672,650, by first depositing upon the original record a suitable metal in the form of an infinitesimally-thin film by a process of vacuum deposit, by then electroplating or otherwise securing upon the film so obtained a sufficiently thick layer of the same or different metal, and by then properly backing up the metal so deposited or otherwise applied to the vacuum film either before or after the separation of the original record from the inclosing coating of metal either by contracting the record or by melting it out or in any other suitable way. The advantage of making a matrix or mold by first depositing upon an original phonograph-record a metal by a process of vacuum deposit is that an absolutely accurate copy in negative of such record will be produced irrespective of the fineness thereof. The mold 9 is preferably made of sufficient mass or thickness as to effectively chill the molten material when the latter is introduced therein, as I shall explain. Carried by the upper part of the mold is an inclosing cap 11, which may be secured onto the mold and which forms a bearing for the plunger 7.

In carrying out my improved process with an apparatus of this type I prefer to proceed substantially as follows: Molten material being placed within the tank or jar 1 is maintained in its liquid or fluid condition by the application of heat. The mold 9, being exposed to the atmospheric temperature, is relatively cold. The plunger 7 is first depressed, so as to force the piston 4 downward within the cylinder, ejecting the liquid material from beneath it, which material passes out through the openings 6. The bore of the cylinder 3 may, as shown, be slightly enlarged below the openings 6, so as to permit the piston 4 to pass beneath the same. As soon as the piston 4 passes below the openings 6 the molten or fluid material enters the cylinder above the piston, so as to fill the cylinder to the level of the liquid in the tank or jar. Owing to the thin wall of the core 5 the latter will almost immediately reach the temperature of the molten material, so that said core will not chill the latter. If a solid core is used, it will require to be immersed within or below the surface of the liquid material for a longer time to enable its temperature to reach that of the molten mass; but with this exception the process will be equally operative with a solid core as with a hollow core.

Assuming the hollow core to be used and that its temperature reaches that of the molten material almost immediately, the plunger 7 will be elevated, so as to carry the charge of molten material above the piston into the mold, as shown in Fig. 2, a greater or less excess of material passing above the mold into the cap 11. By employing the cap 11 it will be obvious that the level of the liquid material in the tank or jar may be varied consid-

erably without affecting the operation. The liquid molten material entering the mold 9 will engage all portions of the record formed on the bore thereof, and the materially lower temperature of the mold will result in the almost instantaneous chilling of the surface of the molten material therein. In order to facilitate this surface-chilling of the liquid molten material entering the mold, the latter may be actually cooled by artificial means below atmospheric temperature—as, for instance, by the circulation of cold water through a water-jacket surrounding the mold or by a blast of cold air equably directed to all portions of the mold. The chilling of the surface of the molten material in the mold results in the setting of the positive impression thus secured from the negative record. The chilling of the molten material in the mold progresses toward the center, and any contraction in bulk will be compensated by the surplus material within the cap 11. As soon as the material within the mold has been chilled throughout the entire thickness thereof the material with the piston, core, cap, and plunger are removed from the cylinder, and the material is allowed to cool by exposure to a cold atmosphere or by an air-blast until the solidified material has contracted away from the bore of the mold, so as to permit it to be removed therefrom by forcing the plunger downward. The plunger is then removed from the core, and the latter is extracted from the cast duplicate, carrying the positive record on its periphery before the material has contracted sufficiently upon the core as to prevent this separation. Since the conductivity of heat from the material is effected slowly, the outer surface of the molded duplicate becomes hard and set, while the inner portion thereof next to the core is still in a relatively plastic condition, so that this separation of the core can with ordinary care be readily effected. The resulting duplicates thus secured after reaching the normal temperature are properly dressed at the ends and are reamed internally to the proper size, being then ready for use.

With records made by my process the contraction of the material radially to separate it from the mold is accompanied by a considerable longitudinal contraction following the instant when the surface is first set by the chilling effect of the mold and progressing until the material reaches the normal temperature, such shrinkage being approximately one per cent. with ordinary blanks. For this reason it is desirable that the original record from which the matrix is made is formed on a phonograph or allied talking-machine having a fewer number of threads on its feed-screw than the instrument on which the duplicates are finally used, in order that when the contraction has progressed to its finality the pitch of the record-thread on the duplicate will correspond to the pitch of the feed-screw of the reproducing-machine or approximately to that pitch, it being possible

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the operation. The entering the mold of the record formed the materially lower result in the chilling of the surface of the mold. In order to facilitating of the liquid in the mold, the latter by artificial means temperature—as, for instance, of cold water surrounding the mold—equally directed to the chilling of the material in the mold to produce a positive impression of the negative record. The material in the mold is centered, and any contraction is compensated by the cap 11. As soon as the mold has been of its entire thickness therefrom, the piston, core, cap, and from the cylinder, and to cool by exposure to an air-blast until the contracted away from the plunger down-then removed from the cast positive record on its material has contracted before this to prevent this conductivity of heat conducted slowly, the outer duplicate becomes hard portion thereof next relatively plastic contraction of the core can readily be effected. The is secured after reaching temperature are properly reamed internally then ready for use. my process the contraction radially to separate accompanied by a contraction following the pitch is first set by the mold and progressing as the normal temperature being approximately uniform blanks. For this at the original record a mold is formed on the duplicating-machine having threads on its feed-screw on which the duplicate is formed in order that when pressed to its finality the thread on the duplicate pitch of the feed-screw of the machine or apparatus, it being possible

with modern reproducing apparatus to effect a satisfactory reproduction from a record, even when the pitch thereof differs slightly from that of the feed-screw of the machine. The pitch of the feed-screw of the machine on which the original record is made will differ from the pitch of the feed-screw of the machine on which the resulting duplicates are to be used to an extent depending upon the coefficient of contraction of the material used and will be determined by experiment with the material employed. It will be of course understood that after the mold has been removed from the cylinder and the separation of the cast duplicate is being effected therefrom a new mold and its accompanying parts may be inserted in place upon the cylinder, and the operations repeatedly carried on therewith.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent is as follows:

1. The process of duplicating cylindrical phonographic records, which consists in first making an original record with a spiral record-groove of greater pitch than that desired on the duplicate to be produced, then in making a hollow cylindrical matrix or mold from said original record, carrying the record in negative on its bore, and in finally making duplicate records from the matrix or mold by introducing therein and engaging therewith material maintained in an abnormally high temperature, whereby the cooling of such duplicate will contract the pitch of the record-groove, as and for the purposes set forth.

2. The process of duplicating phonographic records, which consists in securing a mold containing the record in negative on its bore, in introducing a molten material in the mold to receive a surface impression from such record, in allowing the molten material to set, in contracting the set material, and in separating the contracted molded material by a longitudinal movement, substantially as set forth.

3. The process of duplicating phonographic records, which consists in securing a mold having a record in relief in negative on its bore, in introducing a molten material in the mold around a core in allowing the molten material to set, in contracting the set material, in removing the contracted material and the core from the mold, and in separating the core from the molded material, substantially as set forth.

4. The process of duplicating cylindrical phonograph-records, which consists in forming a cylindrical mold with a record in negative on its bore, in introducing a molten material in the mold to form a cylindrical duplicate, in allowing the duplicate to set, in contracting the duplicate, and in removing the contracted duplicate by a direct longitudinal movement, substantially as set forth.

5. The process of duplicating cylindrical phonograph-records, which consists in forming a cylindrical mold having the record in negative on its bore, in introducing molten material in the mold around a core, whereby a hollow cylindrical duplicate will be formed, in allowing the molten material to set, in contracting the molten material, and in withdrawing the contracted material from the mold by a direct longitudinal movement, substantially as set forth.

6. The process of duplicating cylindrical phonograph-records, which consists in forming a cylindrical mold carrying the record in negative on its bore, in introducing a molten material in the mold around a core, in allowing the material to set, in contracting the material, in withdrawing the contracted material and core from the mold, and in separating the core from the resulting duplicate, substantially as set forth.

7. The process of duplicating cylindrical phonograph-records, which consists in making a cylindrical mold carrying a record in negative on its bore, and of sufficient mass to produce a chilling effect on molten material introduced therein, then in introducing within the mold a molten material, the surface of which becomes chilled by contact with the mold, then in contracting the duplicate so formed, and finally, separating the duplicate from the mold by a direct longitudinal movement, substantially as set forth.

8. The process of duplicating cylindrical phonograph-records, which consists in securing a mold carrying a record in negative on its bore, and of sufficient mass to produce a chilling effect on molten material introduced therein, then in introducing within the mold around a core a molten material, the surface of which is chilled by contact with the mold, then in contracting the material, then in removing the contracted material and core from the mold, and in finally separating the core from the material, substantially as set forth.

9. The process of duplicating cylindrical phonograph-records, which consists in maintaining in a molten condition a mass of material from which the duplicates are to be made, in sustaining a mold over the mass of molten material, said mold carrying on its bore a record in negative, in successively elevating a part of the mass of molten material into the mold, in allowing such molten material within the mold to set, in contracting the set material, and in withdrawing the resulting duplicate from the mold by a direct longitudinal movement, substantially as set forth.

This specification signed and witnessed this 30th day of April, 1900.

THOS. A. EDISON.

Witnesses:

J. F. RANDOLPH,  
FRANK L. DYER.









No. 689,118.

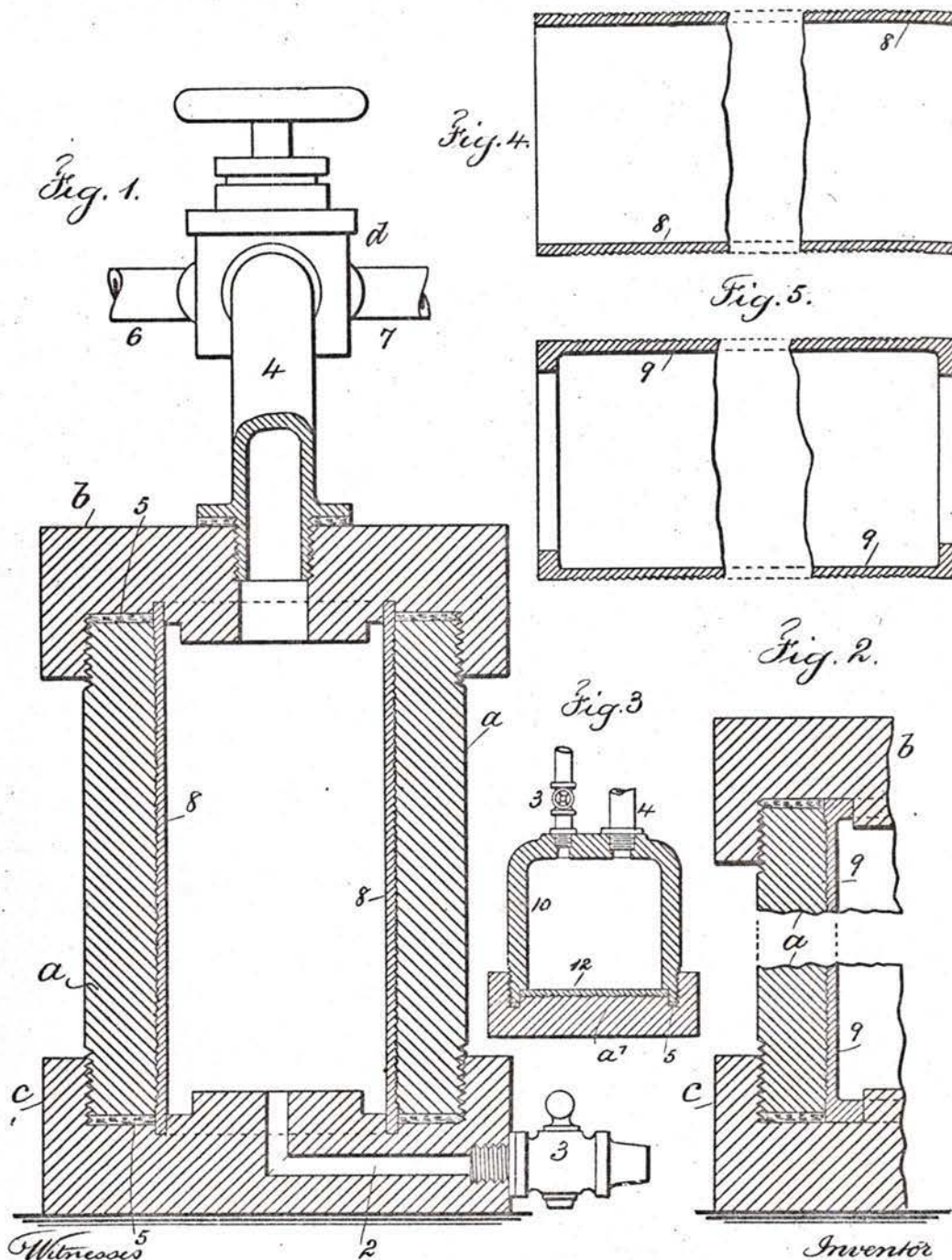
Patented Dec. 17, 1901.

A. N. PETIT.

METHOD OF MAKING DUPLICATE SOUND RECORDS FOR PHONOGRAPHS.

(Application filed Mar. 23, 1901.)

(No Model.)



Witnesses  
*Chas. H. Smith*  
*J. Staib*

Inventor  
*Ademor N. Petit*  
*For L. W. Serrell & Son*

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# UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY.

## METHOD OF MAKING DUPLICATE SOUND-RECORDS FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 689,118, dated December 17, 1901.

Application filed March 23, 1901. Serial No. 52,472. (No model.)

*To all whom it may concern:*

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented an Improvement in Methods of Making Duplicate Sound-Records for Phonographs and Similar Machines, of which the following is a specification.

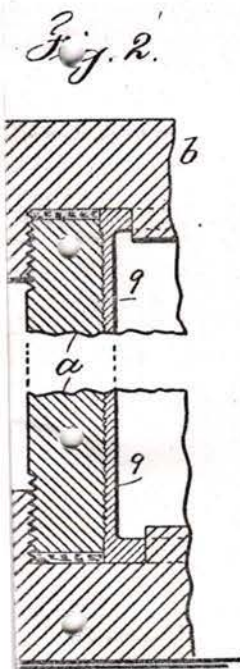
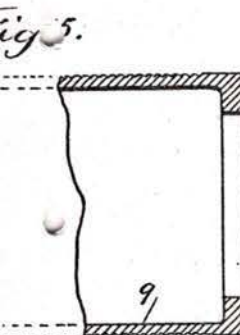
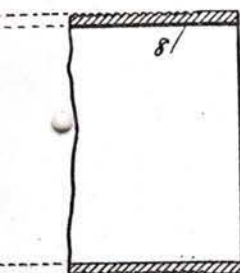
Heretofore matrices have been made of original sound-records, and duplicates have been prepared from such matrices; and my present invention relates to the method of making duplicate sound-records from matrices of an original or master record.

In carrying out my invention I employ a blank formed from such materials or compositions as celluloid, gelatin, lac, glue, gum, collodion, or similar materials. The blank may be a disk or cylinder, and when the blank is in the form of a cylinder it is immaterial whether the same be provided with inturned ends or flanges or not, as this forms no necessary part of the present invention. The surface of this blank contains substances acting not only to soften the same, but otherwise to alter and change the character of the surface and to rearrange or change the molecular character of the material. This condition of the surface may be brought about in either one of two ways, namely: The surface may be treated by a mixture of a solvent for the material of which the blank is formed, together with a fatty material, or the fatty material may be added to the solvent and base in the manufacture of the blank. In the first instance the surface only is affected, permeated, and changed, while in the second instance the entire blank is affected and permeated. The preparation of the blank in the latter instance is advantageous over the former instance only in the point of cheapness, the result being to all intents and purposes absolutely the same. In the method employed by me this blank is placed against a matrix, which it closely fits, and in a suitable apparatus heat and pressure are employed to soften the blank and expand the same and also to force its surface into minute and intimate contact with the surface of the matrix. The heat passes through the blank from within outward and softens the same, and with

the application of pressure to expand the blank and to force its surface into intimate contact with the matrix the softened surface will completely fill all of the delicate interstices and conformations of the matrix, imparting to the surface of the blank a positive of the negative surface of the matrix. Where the surface only has been treated, the same is softened to a slightly-greater extent than the other portions of the blank, it being especially advantageous that the surface should be caused to closely conform to the interstices of the matrix. Where the blank is of celluloid or collodion, I prefer to employ for the treatment of the same a solvent and fatty matter, as set forth in the United States patent granted to me December 4, 1900, No. 662,981. Where the blank is of gelatin, lac, glue, gum, or other similar material, a substance comprising a solvent and other suitable material is to be employed that is capable of treating the blank to alter and change its character or molecular structure in a manner similar or substantially identical with the operation performed by the solvent and fatty matter upon the blank where the same is formed of celluloid. I do not, however, limit myself in the present instance to the materials employed for this purpose nor to the fact of the blank being in the form of a disk or of a cylinder, as the method is equally applicable to either a disk or cylinder.

In the drawings, Figure 1 is a vertical section of an apparatus adapted for the carrying out of my improved method. Fig. 2 is a partial vertical section representing a slight modification. Fig. 3 is a vertical section representing a further modification, and Figs. 4 and 5 are broken sectional views of the blank in the form of a duplicate sound-record cylinder.

The apparatus for carrying out the method herein described and forming the duplicate sound-record cylinder preferably comprises a matrix *a*, which matrix may be made in any manner well known in the art, a head *b*, connected by a threaded flange to one end of the said matrix, and a base *c*, connected also by a threaded flange to the other end of the said matrix in a similar manner, there being packings 5 preferably between the ends of the ma-



Inventor

N. Petit

By *W. H. S. S. S.*  
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trix in the inner surface of the head and base, so as to insure a tight joint. The base *c* is preferably provided with an exit-opening 2 and escape-cock 3, and the head is preferably provided with a pipe 4, connecting with a central opening through the head, and a three-way cock *d*, connected to the pipe 4, and from the opposite side of which there are a steam-pipe 6 and a pipe 7 for compressed air.

10 In Figs. 1 and 4, 8 represents a duplicate sound-record cylinder with plain ends, and 9 in Figs. 2 and 5 represents a duplicate sound-record cylinder with intumed ends or flanges. I prefer to employ within the head and base 15 in the apparatus annular grooves to receive the ends of the foundation, with the object of insuring the steam and air pressure doing the work and preventing the same getting in between the cylindrical blank and the surface 20 of the matrix.

The modification Fig. 3 illustrates the application of my improved method to the treatment of a disk blank. In this modification the matrix *a'* forms the bottom portion of a 25 body, in which 10 forms the upper or cup-shaped portion, to which the matrix is attached, preferably, by a screw-joint with a washer, there being in this case also an annular groove in the base of the portion 10 to receive the edges of the disk blank 12.

The blank, whether a disk or cylinder, prepared in the manner hereinbefore set forth is to be placed in proximity to the matrix and the parts of the apparatus connected and 35 steam admitted by the pipe 6, three-way cock, and pipe 4 into the space or cavity within the apparatus. The disk blank lies against the surface of the matrix, and the blank cylinder fits closely within the matrix. The edges 40 of the disk blank are held in the annular grooves, and the edges of the cylindrical blank are also held in the annular grooves, and the cylinder may be provided with intumed ends or not. The heat of the steam admitted into 45 the cavity or space within the apparatus softens the blank from the back outward, and the pressure of the steam tends not only to expand the blank, but to force the same against the matrix and cause the softened surface to closely fill all the delicate interstices of the matrix and to accurately conform to the negative record of sound thereon. Where the surface only of the blank is treated, 50 the heat of the steam has a greater softening action thereon than on the other portions forming the blank, and this facilitates the material of the blank closely conforming to the negative of the matrix.

Where the entire blank is treated, the action is the same as where only the surface is treated; but the heating action consumes slightly less time, because in this instance the blank is slightly softer in its entire composition than where the surface only is treated. 65 After sufficient time has elapsed for the action of the heat upon the blank the steam is closed off and compressed air admitted, the

escape-cock 3 being preferably opened for a short period to permit of the escape of the steam remaining in the apparatus.

The pressure of compressed air is maintained to hold the blank into intimate contact with the surface of the matrix until the same cools and sets and is sufficiently hard to warrant the removal. This cooling action is advantageously facilitated by submerging the apparatus into a bath of cold water or subjecting the same to external cold of a dry character. The action of the cold is to suddenly chill the matrix and blank and cause a slight contraction of the blank from the matrix. After the parts are cooled and the duplicate sound-record, formerly a blank, is sufficiently set the compressed air is turned off and the parts of the apparatus are separated and the duplicate sound-record removed.

The method herein described is applicable alike to a blank whether the same be in the form of a disk or a cylinder and whether the same be of celluloid or of other suitable material, as hereinbefore set forth.

I do not limit myself either to the form of the blank or to the materials of which the same is composed.

I claim as my invention—

1. The method herein specified of making duplicate sound-records consisting in taking a blank having a surface treated by substances acting not only as solvents to soften the same, but to alter and change the molecular character thereof, inserting said treated blank into a suitable apparatus and upon a matrix embraced therein, applying in the apparatus and upon the blank heat and pressure to soften the blank and its surface and to force the same into intimate contact with the surface of the matrix and maintaining the pressure until the blank is set and thereafter removing the same from the apparatus and matrix, substantially as set forth.

2. The method herein specified of making duplicate sound-records, consisting in taking a blank having a surface treated by substances acting not only as solvents to soften the same but to alter and change the molecular character thereof, inserting said treated blank into a suitable apparatus and upon a matrix embraced therein, applying within the apparatus and upon the blank heat and pressure to soften the blank and its surface and to expand the same into intimate contact with the surface of the matrix and maintaining the pressure and applying cold to the apparatus to cause the duplicate sound-record to set, and thereafter removing the same from the apparatus and matrix, substantially as specified.

3. The method herein specified of making duplicate sound-records, consisting in taking a blank treated by a solvent and a fatty matter to soften the surface and to alter and change the molecular character thereof, inserting said treated blank into an apparatus and against the surface of a matrix forming



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and force the same into intimate contact with  
the surface of the matrix and maintaining the  
pressure until the same is set, and thereafter  
removing the same from the matrix, substan-  
tially as set forth.

4. The method herein specified of making  
duplicate sound-records, consisting in taking  
a blank treated by a solvent and a fatty mat-  
ter to soften the surface and to alter and  
change the molecular character thereof, in-  
serting said treated blank into an apparatus  
and against the surface of a matrix forming  
a part thereof, applying within the apparatus  
and upon the blank heat and pressure to soft-  
ten the blank and its surface and to expand  
and force the same into intimate contact with  
the surface of the matrix and maintaining the  
pressure and applying cold to the apparatus  
to cause the duplicate sound-record to set and  
thereafter removing the same from the ma-  
trix, substantially as set forth.

5. The method herein specified of making  
duplicate sound-record cylinders, consisting  
in taking a blank cylinder of celluloid in  
which the surface of the celluloid is treated  
with a mixture of a solvent and a fatty matter  
to soften the surface and alter and change  
the molecular character thereof, placing the  
treated blank cylinder into a matrix, apply-  
ing within the matrix and within the treated  
cylinder of celluloid heat and pressure to  
soften the celluloid and its treated surface  
and to expand and force the same into inti-  
mate contact with the surface of the matrix  
to impart from the negative matrix a positive  
impression to the celluloid cylinder for mak-  
ing a duplicate sound-record, maintaining  
the pressure within the matrix until the cel-  
luloid cylinder is sufficiently set to maintain  
its shape, and thereafter separating the du-  
plicate sound-record cylinder from the ma-  
trix, substantially as set forth.

6. The method herein specified of making  
duplicate sound-record cylinders, consisting  
in taking a blank cylinder of celluloid in  
which the surface of the celluloid is treated  
with a mixture of a solvent and a fatty mat-  
ter to soften the surface and to alter and  
change the molecular character thereof, plac-  
ing the treated blank cylinder into a matrix,  
applying within the matrix and within the  
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trix to impart from the negative matrix a posi-  
tive impression to the celluloid cylinder for  
making a duplicate sound-record, maintain-  
ing the pressure within the matrix, applying  
cold to the matrix to cause the duplicate  
sound-record cylinder to set and thereafter  
separating the duplicate sound-record cylin-  
der from the matrix, substantially as set forth.

7. The method herein specified of making  
duplicate sound-record cylinders, consisting  
in taking a blank cylinder of celluloid treated  
by a mixture of a solvent and a fatty matter  
to soften the surface and to alter and change  
the molecular character thereof, placing the  
treated blank cylinder into a matrix, apply-  
ing within the matrix and within the treated  
blank heat and pressure to soften the cellu-  
loid blank and force the same into intimate  
contact with the surface of the matrix to im-  
part from the negative matrix a positive im-  
pression to the celluloid cylinder for making  
from the blank a duplicate sound-record,  
maintaining the pressure within the celluloid  
cylinder until the same is sufficiently set to  
maintain its shape, and thereafter separating  
the said duplicate sound-record cylinder from  
the matrix, substantially as set forth.

8. The method herein specified of making  
duplicate sound-record cylinders, consisting  
in taking a blank cylinder of celluloid treated  
by a mixture of a solvent and a fatty matter  
to soften the surface and to alter and change  
the molecular character thereof, placing the  
treated blank cylinder into a matrix, apply-  
ing within the matrix and within the treated  
blank heat and pressure to soften the cellu-  
loid blank and to force the same into inti-  
mate contact with the surface of the matrix  
to impart from the negative matrix a positive  
impression to the celluloid cylinder for mak-  
ing from the blank a duplicate sound-record,  
maintaining the pressure within the celluloid  
cylinder and applying cold to the matrix to  
cause the duplicate sound-record cylinder to  
set and thereafter separating the said dupli-  
cate sound-record cylinder from the matrix,  
substantially as set forth.

Signed by me this 18th day of March, 1901.

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,  
S. T. HAVILAND.









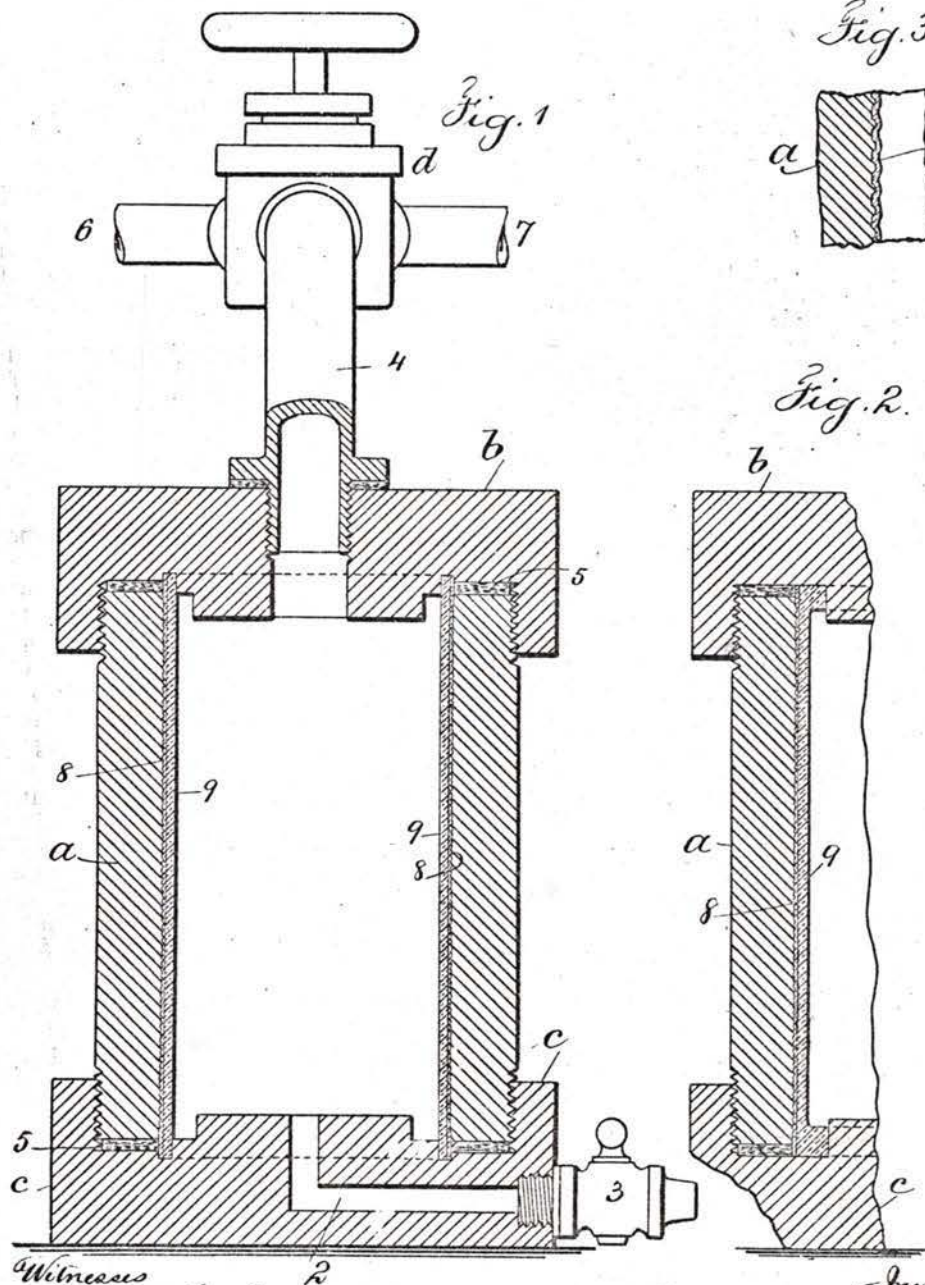
808 No. 689,408.

Patented Dec. 24, 1901.

A. N. PETIT.  
METHOD OF MAKING SOUND RECORD CYLINDERS.

(Application filed Dec. 8, 1900.)

(No Model.)



Witnesses  
Chas. H. Smith  
J. Staib

Inventor  
Ademor N. Petit.  
By L. W. Lurrell & Son

UN

ADEMOR N

ME

SPECIFI

To all whom

Be it known  
that I, ADEMOR N. PETIT, of the County of  
Hennepin, State of Minnesota, have invented  
a new and useful Method of Making Sound  
Record Cylinders, of which the following is a  
brief description.

Heretofore original sound record cylinders  
have been prepared by the present invention  
making duplicate cylinders from a single  
matrix. The same is an improvement on the  
method set forth in my application filed July 31,  
1900.

In carrying out the present invention, I  
prefer to use a rotating motion, and to set  
the face of the cylinder under the pressure of  
the record cylinder. I serve for the surface of  
the record cylinder. I prefer to use a fluid  
medium, such as glue, gum, or oil, and this  
may be applied in a fluid state to the  
cylindrical surface, and then the two  
or part of the cylinder and connect  
adhesion to the surface of the record cylinder.  
I prefer to use a shell or a surface of the  
record cylinder, and then the two by the  
form of a cylinder.

I prefer to use a steam pressure in  
tightening the cylinder at the same  
time, so that the adhesion is  
as sufficient.



# UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY, ASSIGNOR TO HIMSELF AND  
ALBERT O. PETIT, OF NEWARK, NEW JERSEY.

## METHOD OF MAKING SOUND-RECORD CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 689,408, dated December 24, 1901.

Application filed December 8, 1900. Serial No. 39,127. (No specimens.)

*To all whom it may concern:*

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented an Improvement in the Method of Making Duplicate Sound-Record Cylinders, of which the following is a specification.

Heretofore matrices have been made of original sound-records, and duplicates have been prepared from such matrices; and my present invention relates to the method of making duplicate sound-record cylinders from matrices of an original record, and the same is an improvement upon the method set forth in my application, Serial No. 25,386, filed July 31, 1900.

In carrying out my present invention I apply to the matrix-surface a material in a fluid state, preferably by a brush and centrifugal motion, and which material as the same dries and sets forms a skin or film upon the surface of the matrix, which film takes the impression of the matrix in its surface and serves for the surface of the duplicate sound-record cylinder. As a material for coating the surface of the matrix and forming the film I prefer to employ celluloid, gelatin, lac, glue, gum, collodion, or similar material, and this may be applied to any desired thickness in a fluid state. I employ a foundation or cylindrical shell fitting closely within the said film, and this foundation or shell is in whole or part of material adapted to be softened and connected by heat and pressure through adhesion to the duplicate sound-record film. I prefer that the material of the foundation or shell should be impregnated with or have a surface of the same material as that composing the film, so that connection between the two by heat and pressure may be in the form of a cementing action.

I prefer to employ an apparatus into which steam may be introduced under considerable pressure for the purpose of heating and softening the foundation or cylindrical shell and at the same time expanding the same sufficiently so as to form an intimate contact and adhesion with the film, and I propose as soon as sufficient time has elapsed to insure a con-

nection of the foundation and film in this manner to replace the steam under pressure by air under pressure and to chill the matrix, so as to cool and set the parts and thereafter to maintain the pressure of air for a sufficient time until the connected film and foundation are thoroughly set and cooled, after which the same is to be removed from the matrix.

In the drawings, Figure 1 is a vertical section of a device adapted for the carrying out of my improved method. Fig. 2 is a partial vertical section representing a modification, and Fig. 3 is a detached vertical section showing part of a connected matrix and film upon a larger scale.

The improved apparatus for carrying out the method and making the article is preferably composed of a matrix *a*, a head *b*, connected by a threaded flange to one end of the said matrix, a base *c*, connected also by a threaded flange to the other end of the said matrix in a similar manner, there being packings *5*, preferably, between the ends of the matrix and the head and base, so as to insure a tight joint. The base *c* is preferably provided with an exit-opening *2* and an escape-cock *3*, and the head is preferably provided with a pipe *4*, and a three-way cock *d* connected to the pipe *4*, and from the opposite side of which there is a steam-pipe *6* and a pipe *7* for compressed air.

*8* represents the film duplicate sound-record, and *9* the foundation or cylindrical shell. I prefer to employ within the head and base annular grooves to receive the foundation ends, with the object of insuring the steam and air pressure doing the work and preventing the same getting in between the foundation and skin.

With the matrix separated and disconnected in relation to the head and base, and which matrix is formed in any manner well known in the art, the inner surface of the matrix is to be coated to any desired thickness by a material in a fluid state. This material may be applied by a brush or centrifugal motion, or both, so as to impart to the matrix-surface an even homogeneous film until the desired thickness is obtained, when the same is allowed to set or dry to yield an impression of

Fig. 3

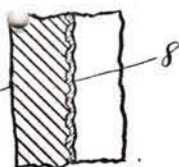
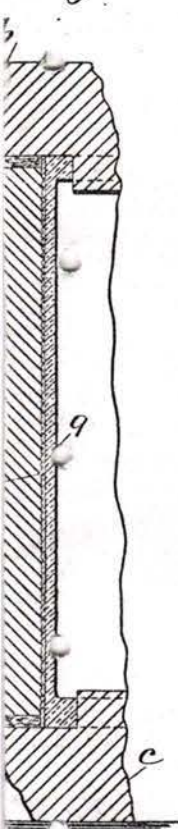


Fig. 2



Inventor  
A. N. Petit.  
L. S. L. Son  
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the matrix. The film thus obtained is firm, dense, and yet flexible, and is preferably composed of such materials as have hereinbefore been referred to.

- 5 The foundation 9 or cylindrical shell is adapted to fit closely within the film 8, and this foundation may be made with integral inturnd ends or not, as this forms no necessary part of the invention. I have, however, shown in Fig. 1 a foundation without inturnd ends, and in Fig. 2 a foundation with inturnd ends as the method of the present invention is equally applicable to both forms of foundation. This foundation is preferably made of material adapted to be softened and connected by heat and pressure through adhesion to the duplicate sound-record film, and the material of the foundation is preferably of such a nature as to carry a substance of a similar nature to that composing the film either by being impregnated with or by having an applied surface coating of such material, so that the connection formed between the two by heat and pressure may be a cementing action. The material of the foundation may be and preferably is the same as that of the film, but loaded with pigment to give body and cheapness.

After the film 8 has been made and the foundation 9 inserted within the matrix the head *b* and the base *c* are connected to the matrix, as shown, and the escape-cock 3 closed. Steam is then admitted by the pipe 6 and the three-way cock *d* and pipe 4 into the cavity or space within the matrix and within the said foundation. The heat softens the foundation or cylindrical shell and the pressure expands the same. The heat also softens the film so that the surface of the film and the surface of the expanding foundation come into intimate contact and connection and a cementing action is produced between the two, because of the substances of similar nature, by the heat and pressure, so that they are connected by adhesion. After sufficient time has elapsed for this operation I prefer to close off the steam and to replace the same by air under pressure and thereafter to submerge the matrix into a bath of cold water, which suddenly chills the matrix, the film, and the foundation, while the pressure is maintained within the same. I thereafter remove the matrix from the water or cooling mixture. In substituting the air under pressure for the steam under pressure I turn the three-way cock and admit compressed air and open the escape-cock to blow out the steam. After the steam has been blown out the escape-cock 3 is closed and the air-pressure maintained within the matrix until the parts are so thoroughly cooled and set that it is perfectly safe to close off the compressed air, separate the parts, and take out the duplicate sound-record cylinder complete.

If the film 8 is composed of celluloid, the

foundation 9 should either be impregnated with a solvent of celluloid or should have an applied surface of celluloid or a solvent adhering thereto, so that the same, when softened with the film and forced by pressure into connection with the materials, will join and form a homogeneous connected or cemented mass, and in any event, whatever material the film may be composed of, the backing or foundation should carry a substance of a similar nature by being either impregnated with the same or having an applied surface coating of such material, which under heat and pressure will combine or commingle with the material of the skin so as to form a homogeneous or permanently-connected mass.

I claim as my invention—

1. The method herein specified of making duplicate sound-record cylinders, consisting in forming upon the surface of a matrix a film of material applied thereto, inserting within the matrix and film a foundation or cylindrical shell closely fitting the same and which shell carries a substance of a similar nature to that composing the film applying heat and pressure within the foundation and matrix to soften the material of the foundation or cylindrical shell and that of the film and to force the same into intimate contact and adhesion, and maintaining the pressure until the parts set and cool, substantially as set forth.

2. The method herein specified of making duplicate sound-record cylinders, consisting in forming upon the surface of a matrix a film of material applied thereto, inserting within the matrix and film a foundation or cylindrical shell closely fitting the same and which shell carries a substance of a similar nature to that composing the film, applying heat and pressure within the foundation and matrix to soften the material of the foundation or cylindrical shell and that of the film and to force the same into intimate contact and adhesion, and chilling the matrix and the connected film and foundation to set and cool the parts and maintaining the pressure during the chilling and until the operations are fully completed, substantially as set forth.

3. The method herein specified of making duplicate sound-record cylinders, consisting in forming upon the surface of a matrix a film of material applied thereto, inserting within the matrix and film a foundation or cylindrical shell closely fitting the same and which shell carries a substance of a similar nature to that composing the film, applying pressure and heat within the foundation and matrix to soften the material of the foundation or cylindrical shell and that of the film and to force the same into intimate contact and adhesion, displacing the material producing the heat and pressure by air or similar fluid under pressure and chilling the matrix by immersing the same in a cooling material which at the same time chills the connected film

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and either be impregnated with celluloid or should have an adhesive surface of celluloid or a solvent adhesive that the same, when softened and forced by pressure into the materials, will join and become connected or cemented together, whatever material is composed of, the backing or support to carry a substance of a similar nature being either impregnated with celluloid or having an applied surface of celluloid material, which under heat and pressure will combine or commingle with the skin so as to form a homogeneously-connected mass.

3. The method herein specified of making duplicate sound-record cylinders, consisting in forming upon the surface of a matrix a film of material applied thereto, placing within the film a permanent base or backing, applying heat and pressure to soften the parts and force them into intimate contact and adhesion, substantially as specified.

4. The method herein specified of making duplicate sound-record cylinders, consisting in forming upon the surface of a matrix a film of material applied thereto, inserting within the film a foundation or cylinder of material fitting the same and which is of a similar nature to the film, applying heat and pressure to the foundation and matrix to force them into intimate contact and adhesion, substantially as specified.

5. The method herein specified of making duplicate sound-record cylinders, consisting in forming upon the surface of a matrix a film of material applied thereto, inserting within the film a foundation or cylinder of material fitting the same and which is of a similar nature to the film, applying pressure to the foundation and matrix to force them into intimate contact and adhesion, substantially as specified.

and foundation, removing the same from the chilling mixture, and maintaining the pressure thereafter until the parts are thoroughly set and the finished sound-record ready for removal, substantially as set forth.

6. The method herein specified of making duplicate sound-record cylinders consisting in bringing a prepared film-surface into opposition to a contained and substantially contacting permanent base or backing, applying heat to soften the parts and a pressure that is maintained as desired to unite the parts and insure the impressing of the film-surface by a record-matrix, substantially as specified.

Signed by me this 3d day of December, 1900.

into said film-surface by the same pressure, substantially as specified.

7. The method herein specified of making duplicate sound-record cylinders consisting in bringing a prepared film-surface into opposition to a contained and substantially contacting permanent base or backing, applying heat to soften the parts and a pressure that is maintained as desired to unite the parts and insure the impressing of the film-surface by a record-matrix, substantially as specified.

Signed by me this 3d day of December, 1900.

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,  
S. T. HAVILAND.













July 29, 1902.

# UNITED STATES PATENT OFFICE.

WILLIAM F. MESSER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE LAMBERT COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## APPARATUS FOR REPRODUCING PHONOGRAMS.

SPECIFICATION forming part of Letters Patent No. 705,772, dated July 29, 1902.

Application filed February 1, 1902. Serial No. 92,110. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM F. MESSER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Reproducing Phonograms, of which the following is a specification.

This invention relates to that class of apparatus by which duplicate phonographic records in any desired number may be made, and particularly to the production of what are termed "indestructible" records or records made of celluloid or similar infrangible material, and more especially to the production of records having relatively thin walls of celluloid and inwardly-extending annular end flanges.

The principle object of the invention is to provide a simple, economical, and efficient apparatus for reproducing phonograms or record-cylinders in any desired number.

A further object of the invention is to provide means for holding the ends of the record-cylinder in place against the inner walls of the base and head, so as to seal the pressure-chamber while pressure is being applied to force the record-cylinder against the matrix and hold the record-cylinder sufficiently out of intimate contact with the matrix at each end to permit the escape of air from between the ends of the record-cylinder and matrix until the entire outer surface of the cylinder has been pressed against the inner surface of the matrix.

Other objects will appear from an inspection of the drawing and the following description and claims.

The accompanying drawing represents a vertical side elevation in section of one style of an apparatus constructed in accordance with my improvements.

In constructing a machine in accordance with my improvements and using the same I provide a matrix *a* of the desired size, shape, and strength and which is preferably formed in the manner shown and described in Patent No. 645,920, issued to Thomas B. Lambert March 20, 1900. The matrix is in the form of a hollow cylinder open at both ends and is provided on its inner surface with sound-record indentations—that is to say, it has negative indentations corresponding to those

upon the original sound-record—so that when the record-blank receives the imprint of the inner surface of the matrix it becomes a duplicate of the original or master record. This matrix is placed in an upright position upon a base *b*, which forms a closure for one end of the matrix, the natural irregularities of the end of the matrix and surface of the base forming an outlet sufficient to permit the air to escape from between the blank record and matrix. The matrix is surrounded by an encircling metallic shell *c*, between which and the matrix a backing *s*, of plaster-of-paris or similar material, is placed for holding the matrix in place and affording the desired and necessary rigidity and strength to withstand the pressures incident to its operative use. A movable head portion *d* is provided and mounted above the matrix by means of a stem *f*, extending therefrom through a bearing *g* in a stationary head *e*. The stem of the movable head may be integral therewith or connected thereto, as shown, by suitable means, such as the lug *g* upon the head, fitted into a slot or notch *h* in the stem and held in place in such stem by a set-screw *i*, connecting the lug and stem. A transverse perforation *j* is made in the stem of the movable head adapted to receive a wedge *k*, which contacts with the stationary head, and thereby holds the stem and movable head in the desired position with relation to the matrix. A rigid standard *l* and bottom portion *m*, both preferably integral with the stationary head and base, connect such head and base and hold them in fixed rigid relation to each other and should be of sufficient strength to hold the movable head in position against the pressure to be applied between such head and base. The movable head is made of such diameter as to leave a space *n* between it and the matrix when both are in operative position, thus permitting the air to escape from between the record-blank and the matrix when pressure is applied to the inner side of the record-blank. By this arrangement a chamber is formed between the matrix, the movable head, and the base, which chamber is provided with vents *n* and *n'* at the top and bottom of the matrix. A blank record-cylinder *o*, of celluloid or similar material, is then placed within the chamber with its respective ends in contact with the head and base. An inner pres-

Inventor:  
W. F. Messer:

J. Sheridan  
Atty



sure-chamber  $p$  is thus formed between the record-cylinder and the head and base portion, which is or becomes hermetically sealed upon the admission of steam under pressure thereto, as hereinafter described. It is desirable to first soften the record-cylinder, so that it may be expanded against the record-surface of the matrix. In order to accomplish this, a heated fluid, preferably steam under about fifty pounds pressure to the square inch, is forced into the record-chamber through a pressure-supply pipe  $q$ , which is connected by means of a branch pipe  $r$  with a suitable source of steam-supply. The steam is permitted to escape through an exhaust-pipe  $s$ , connected with the outer air by means of a pipe  $t$ . The steam is kept at a substantially uniform pressure within the record-chamber, so as to by means of its peculiar heating qualities and other actions soften the record and force it out against the inner indented surface of the matrix. After this has been accomplished the steam-supply is shut off by means of a valve  $u$ , and a supply of cold air under pressure is permitted to enter through the supply-pipe  $q$  by opening the valve  $v$  on a second branch pipe  $w$ , which connects with a source of cool air under pressure and keeps up as great or a greater pressure than before. A valve  $y$  on the exhaust-pipe may be left open, so that all moisture and steam are blown out of the cylinder formed by the record. When the steam has been blown out, the next step is to close the valve  $y$  and permit cool air under pressure to remain in the record-chamber until such blank record is sufficiently cooled and hardened. Thus cooled and shrunk it is easily removed without collapsing.

As shown in the drawings, the record-cylinder is for many purposes preferably made with internal end flanges 2 and 3, and when thin material is used, as above suggested, such flanges are softened as well as the body of the record by the admission of steam under pressure. When steam under pressure is admitted, they are immediately softened and forced against the head on one end and the base on the other, and some of the fluid under pressure naturally escapes around such end before the hermetical seals are formed. If this fluid under pressure is not taken care of immediately—that is, permitted to escape from all contact with the record-surface—or if it is allowed to get between the record and the matrix, there is great danger of the surface of the phonogram being either destroyed or so impaired that it is of little or no value. It becomes necessary, therefore, to provide means by which all fluid, such as air or steam, outside of the hermetically-sealed chamber may be immediately permitted to escape and that the end flanges be hermetically sealed to the head and base as quickly and firmly as possible. In order to accomplish these results, the head portion is provided with perforations 4, arranged in a circle adjacent to

the inner edge of the record and at the desired distance from its outer edge. An annular groove 5 is thus provided in the inner surface of the head, into which the perforations open. In the same manner as above described in connection with the head and for the same purposes with relation to the opposite end flange and base portion perforations 6 and an annular groove 7 are provided in the inner surface of the base portion. By means of these perforations in the head and base, in connection with the other elements described, when fluid under pressure, such as steam, is admitted to the pressure-chamber formed within the record-cylinder it follows the path of least resistance and presses toward the perforations in the head and base, carrying the adjacent flanges of the record-cylinder with it, pressing them tightly in place against the end walls or base and head, and forming a sealed chamber. The perforations being left open throughout the operation of completing the record, the flanges are thus held in position to prevent the escape of steam or other fluid from the chamber within the record-cylinder by forming a sealed connection between the record-cylinder and the head and base. It should be understood, however, that the perforations in the head and base should only be sufficiently large to permit the desired yielding of the record-blank and prevent the escape of the fluid by blowing a puncture through the material of which the flange is formed. I find in practice that perforations one-fiftieth of an inch in diameter serve the purpose. An annular space one five-thousandth of an inch wide is sufficient between the head and matrix to permit the air to escape from between the record-cylinder and matrix and may be formed by either making the head of such diameter as to leave a sufficient space or by holding the head a sufficient distance from the matrix to leave a space of the desired size. I prefer, however, to employ a head of smaller diameter than the inner diameter of the matrix. It will be also readily apparent to those skilled in the art that the annular groove in either the head or base would operate with more or less success to hold the end flanges and thereby the ends of the record-cylinder in place with one vent or perforation communicating with such groove; but I prefer to employ a plurality of perforations or vents.

I claim—

1. In an apparatus of the class described, the combination of a cylindrical matrix, a base portion at one end thereof arranged to contact with the end of a blank record-cylinder, and a head portion arranged in contact with the other end of the record-cylinder and provided with outlet means communicating with the inner surface of such head and extending to the outer surface of such record-cylinder, substantially as described.

2. In an apparatus of the class described, the combination of a cylindrical matrix, a base

portion at one end thereof arranged to contact with the end of a blank record-cylinder, and a head portion arranged in contact with the other end of the record-cylinder, substantially as described.

3. In an apparatus of the class described, the combination of a cylindrical matrix, a base portion at one end thereof arranged to contact with the end of a blank record-cylinder, and a head portion arranged in contact with the other end of the record-cylinder, substantially as described.

4. In an apparatus of the class described, the combination of a cylindrical matrix, a base portion at one end thereof arranged to contact with the end of a blank record-cylinder, and a head portion arranged in contact with the other end of the record-cylinder, substantially as described.

5. In an apparatus of the class described, the combination of a cylindrical matrix, a base portion at one end thereof arranged to contact with the end of a blank record-cylinder, and a head portion arranged in contact with the other end of the record-cylinder, substantially as described.

6. In an apparatus of the class described, the combination of a cylindrical matrix, a base portion at one end thereof arranged to contact with the end of a blank record-cylinder, and a head portion arranged in contact with the other end of the record-cylinder, substantially as described.

7. In an apparatus of the class described, the combination of a cylindrical matrix, a base portion at one end thereof arranged to contact with the end of a blank record-cylinder, and a head portion arranged in contact with the other end of the record-cylinder, substantially as described.



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outer edge. An an-  
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with relation to the op-  
base portion perfora-  
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the base portion. By  
tions in the head and  
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under pressure, such  
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ssing them tightly in  
walls or base and head,  
chamber. The perfora-  
throughout the opera-  
record, the flanges are  
to prevent the escape  
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lar groove in either the  
perce with more or less  
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d-cylinder in place with  
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refer to employ a plural  
vents.

s of the class described,  
cylindrical matrix, a base  
hereof arranged to con-  
a blank record-cylinder,  
arranged in contact with  
record-cylinder and pro-  
ans communicating with  
such head and extend-  
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described.

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cylindrical matrix, a base

portion at one end thereof arranged to con-  
tact with the end of a blank record-cylinder  
and provided with outlet means communi-  
cating with the inner surface of such base and  
extending to the outer surface of such record-  
cylinder, and a head portion arranged in con-  
tact with the other end of the blank record-  
cylinder, substantially as described.

3. In an apparatus of the class described,  
the combination of a cylindrical matrix, a base  
portion at one end thereof arranged to con-  
tact with the end of a blank record-cylinder  
and provided with perforations extending  
through such base and communicating with  
the inner surface thereof, and a head portion  
arranged in contact with the other end of the  
blank record-cylinder and provided with per-  
forations in such head communicating with  
the inner surface thereof, substantially as de-  
scribed.

4. In an apparatus of the class described,  
the combination of a cylindrical matrix, a base  
portion at one end thereof arranged to contact  
with the end of a blank record-cylinder ar-  
ranged within the matrix and provided with a  
groove in its inner surface and perforated out-  
let means through such base communicating  
with the groove, and a head portion arranged at  
the other end of the record-cylinder forming  
in connection with the record-cylinder and  
base a pressure-chamber, substantially as de-  
scribed.

5. In an apparatus of the class described,  
the combination of a cylindrical matrix, a base  
portion at one end thereof arranged to con-  
tact with the end of a record-cylinder and pro-  
vided with a groove in its inner surface and  
with outlet means through such base com-  
municating with such groove, and a head por-  
tion arranged in contact with the other end  
of the record-cylinder and provided with a  
groove in its inner surface and with outlet  
means through such head communicating  
with the groove, substantially as described.

6. In an apparatus of the class described,  
the combination of a cylindrical matrix, a base  
portion at one end thereof arranged to con-  
tact with the end of a blank record-cylinder,  
and a head portion arranged in contact with  
the other end of the blank record-cylinder and  
providing an opening communicating with  
the inner surface of the matrix outside of the  
record-cylinder and provided with perfora-  
tions communicating with the inner surface  
of such head, substantially as described.

7. In an apparatus of the class described,  
the combination of a cylindrical matrix, a base  
portion at one end thereof arranged to con-  
tact with the end of a blank record-cylinder  
and provide a vent communicating with the  
inner surfaces of the matrix and provided  
with outlet means communicating with the  
inner surface of such base and extending to  
the outer surface of such record-cylinder, and  
a head portion arranged in contact with the  
other end of the record-cylinder to form in  
connection with the record-cylinder and base

a chamber within such record-cylinder, sub-  
stantially as described.

8. In an apparatus of the class described,  
the combination of a cylindrical matrix, a base  
portion at one end thereof arranged to con-  
tact with the end of a blank record-cylinder  
having inwardly-extending end flanges, a  
head portion arranged in contact with the in-  
ner flange on the other end of the record-cyl-  
inder provided with perforations communi-  
cating with the inner surface of such head at  
points adjacent to the inner edge of such end  
flange and extending to the outer surface of  
such record-cylinder, substantially as de-  
scribed.

9. In an apparatus of the class described,  
the combination of a cylindrical matrix, a base  
portion arranged at the end thereof in con-  
tact with the end portion of a blank record-  
cylinder having inwardly-extending flanges,  
such base portion being provided with per-  
forations communicating with the inner surface  
thereof at points adjacent to the inner edge  
of the end flange of the record-cylinder, and  
a head portion arranged in contact with the  
opposite end of the record-cylinder and the  
end flange thereon and provided with per-  
forations through such head communicating  
with the inner surface of the head at points  
adjacent to the inner edge of such end flange,  
substantially as described.

10. In an apparatus of the class described,  
the combination of a cylindrical matrix, a base  
portion arranged at one end thereof in con-  
tact with the end of a blank record-cylinder  
and provided with perforations extending  
through such base and communicating with  
the inner surface thereof, a head portion ar-  
ranged in contact with the other end of the  
blank record-cylinder and provided with per-  
forations in such head communicating with  
the space between it and the record-cylinder,  
a frame for holding the base in position, and  
means for admitting fluid under pressure to  
the chamber formed within the record-cyl-  
inder between the base and head, substantially  
as described.

11. In an apparatus of the class described,  
a movable head portion adapted to close the  
end of a blank record-cylinder and provided  
with perforations through such head portion  
communicating with the inner surface there-  
of and extending to the outer surface of such  
record-cylinder, substantially as described.

12. In an apparatus of the class described,  
a base portion adapted to close one end of a  
blank record-cylinder to be operated upon  
and provided with perforations through such  
base portion communicating with the inner  
surface thereof and extending to the outer  
surface of such record-cylinder, substantially  
as described.

WILLIAM F. MESSER.

Witnesses:

THOMAS E. SHERIDAN,  
HARRY IRWIN CROMER.









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No. 742,454.

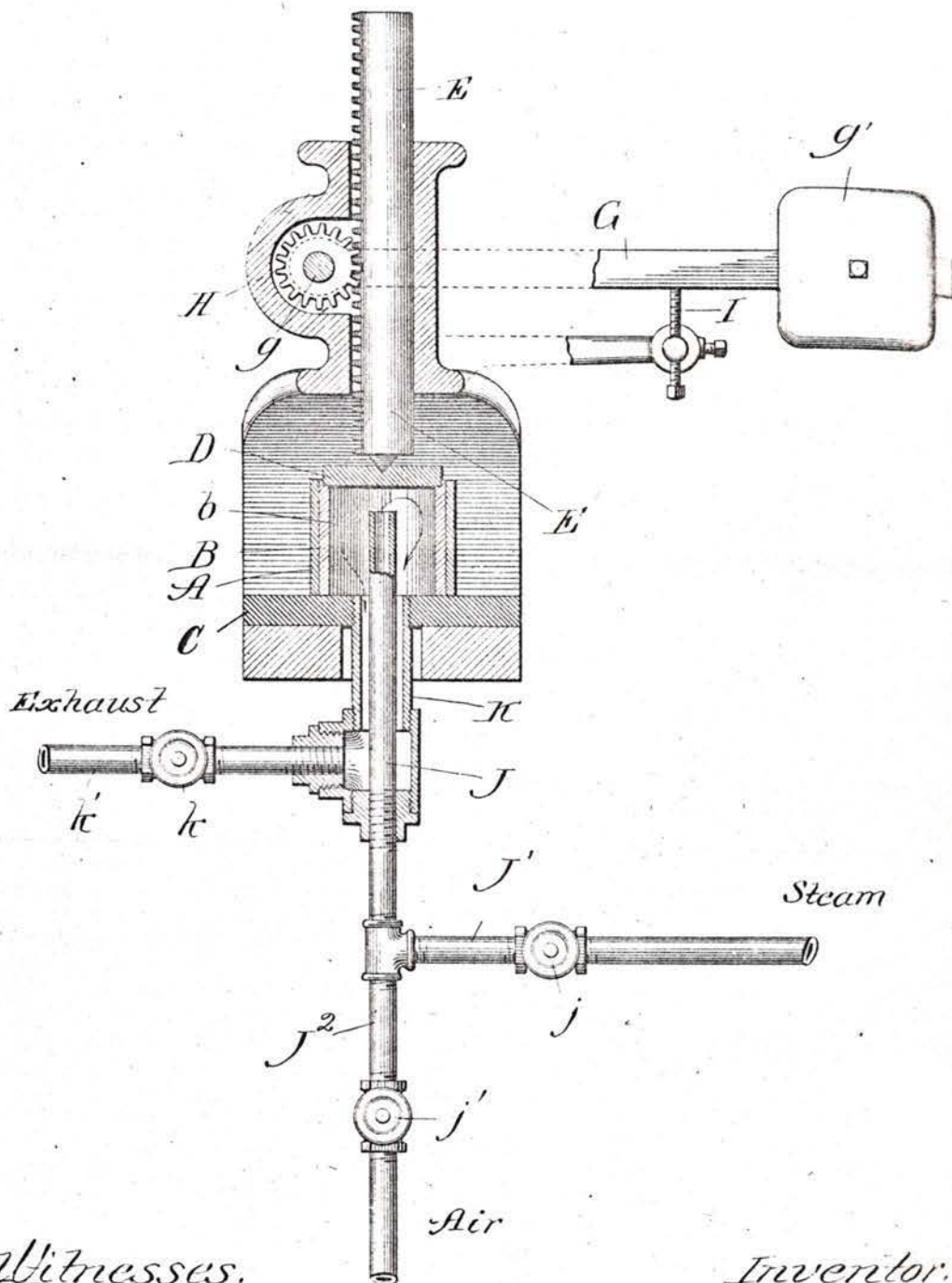
PATENTED OCT. 27, 1903.

T. B. LAMBERT.

## PROCESS OF REPRODUCING PHONOGRAPHIC RECORDS.

APPLICATION FILED JUNE 14, 1900.

NO MODEL.



Witnesses.  
*Chas. E. Gaylord,*  
*John Enders, Jr.*

Inventor.  
*Thomas B. Lambert.*  
*By Thomas F. Sheridan*  
 Atty-

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RECORDS.

## UNITED STATES PATENT OFFICE.

THOMAS B. LAMBERT, OF CHICAGO, ILLINOIS, ASSIGNOR TO LAMBERT COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## PROCESS OF REPRODUCING PHONOGRAPHIC RECORDS.

SPECIFICATION forming part of Letters Patent No. 742,454, dated October 27, 1903.

Application filed June 14, 1900. Serial No. 20,249. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS B. LAMBERT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Processes of Producing Duplicate Phonographic Records, of which the following is a specification.

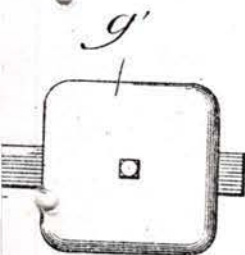
This invention relates particularly to processes by which the ordinary record now used in connection with phonographs may be copied or duplicated any number of times, and especially to the production of indestructible duplicate-records, all of which will more fully hereinafter appear.

The principal object of the invention is to provide a simple, economical, and efficient process of reproducing phonographic records; and the invention consists in the process hereinafter described and claimed.

The accompanying drawing represents a vertical sectional elevation of one style of apparatus in which my improved process may be carried out.

In carrying out my process I provide a matrix A of the desired size, shape, and strength and which is preferably cylindrical in contour and formed of copper which has been electrochemically deposited upon a wax cylinder in the manner shown and described in Patent No. 645,920, issued to me on the 20th day of March, 1900, and which it is therefore unnecessary to show and describe in detail here. The inner side of this copper matrix is provided, as is shown in the above-named patent, with a negative of a record-cylinder provided with a surface having indentations which correspond with the projecting portions of the record and projections which correspond with the indentations on the record-cylinder, and in order to make duplicate records I place within such matrix a blank record-cylinder B, formed of celluloid or similar substance—in fact, it can be formed of any substance which is susceptible of being softened by heat and rehardened by cooling. This blank record-cylinder, which may be made of celluloid or other desirable material, is, as above stated, placed within the matrix, so that the record and matrix both rest upon

a base C, which acts as a closure for one end of the chamber inside the record and which I will hereinafter term the "record-chamber" b. A head portion D is next placed upon the record-cylinder to complete the closing of the record-chamber. An air-tight chamber, which I will designate as the "record-chamber," is thus formed within the blank record-cylinder and between the movable head D and the base C. This movable head should be of such diameter as to leave an opening between it and the matrix when the head is in contact with the record-cylinder at a point within or near the matrix, and the opening should be narrower than the thickness of the record-cylinder. The opening will then be closed and sealed by the record-cylinder when pressure sufficient to expand it is applied within, and, as will be readily seen, this opening affords an outlet for the air to escape between the head and matrix and from between the record-cylinder and matrix. This arrangement of the head and matrix leaves the matrix to rest loosely upon the base without anything to hold it unyieldingly against the base. The natural irregularities of the adjacent surfaces of the matrix and base thus afford a sufficient opening between the lower end of the matrix and base to permit air to escape from between the record-cylinder and matrix. In fact, in the absence of anything to hold the matrix rigidly and unyieldingly against the base—such, for instance, as a head in unyielding contact with the opposite end of the matrix—the application of the pressure within the record will force the air from between the record-cylinder and base however regular their adjacent surfaces may be. The natural irregularities of the adjacent surfaces, however, insure a sufficient vent when the relation of the head and matrix is as described, and a gear-spindle E is allowed to drop down thereon. A weighted lever G is provided and mounted upon the shaft g, which carries a pinion H, meshing with the rack e, which in turn operates the spindle above named, and in connection with a stop-screw I determines the position and the amount of pressure with which this spindle may rest on the head.



Steam

Inventor:

Lambert

Attest

Atty



It is now desirable to soften the record-cylinder so that it may be expanded out against the indented record-surface of the matrix and expand the record-cylinder. In order to accomplish this, steam under about thirty pounds pressure per the square inch is forced into the record-chamber through a supply-pipe J, which is connected, by means of a branch pipe J', with a suitable source of steam-supply. The steam is permitted to escape again out through an exhaust-pipe K, connected with the outer air by means of the branch K'. The steam is kept at a substantially uniform pressure within the record-cylinder chamber, so as to by means of its heat and other actions soften the record and force it out against the inner indented surface of the matrix. After this has been accomplished—and experience teaches the operator just how long under certain pressure it takes the steam to accomplish this result—the steam-supply is shut off by means of the valve j and a supply of cool air under pressure is permitted to enter through the supply-pipe J by opening the valve j' on a second branch pipe J<sup>2</sup>, which connects with a source of air under pressure and keeps up practically the same pressure as heretofore, but leaves the valve k on the exhaust-pipe open, so that all moisture and steam is blown out of the record-chamber, as above described. When the steam has been blown out, the next step is to shut the valve k and permit air under the desired pressure to stay in the record-chamber until such blank record is substantially forced into all the indentations made by the record on the inner surface of the copper matrix. As soon as this has been accomplished the air-supply is shut off, leaving just enough air inside the record-chamber to cool the same, and the exhaust-valve k is opened sufficiently to permit the air to blow through under certain pressure, and thus assist materially in cooling the record-cylinder.

When the duplication of the record-cylinder has been completed, the spindle E is raised, the head D removed, and the matrix, with its duplicated record, removed from contact with the apparatus. The cooling of the record-cylinder also shrinks it, so that it can be easily removed from engagement with the matrix.

Whenever desirable or necessary, the outer periphery of the matrix may be backed by plaster-of-paris, having a lead or other metallic confining-ring to give it sufficient rigidity to secure the duplication or reproduction of the records, and this is very clearly shown and described in the patent above referred to.

I claim—

1. The process of producing records of the class described, which consists in placing a blank record-cylinder adjacent to the record-surface of an indented matrix, then forcing a supply of heated fluid under pressure

against the exposed surface of the record-blank until such record has been softened and forced into the indentations of the matrix, and then furnishing a supply of cool fluid under pressure to complete the production of the record, and finally removing the record-cylinder, substantially as described.

2. The process of producing duplicate phonographic records, which consists in placing a blank record-cylinder adjacent to the inner indented surface of a cylindrical matrix, then passing into the chamber formed inside the record-cylinder a supply of steam under pressure, furnishing a supply of cool fluid under pressure to blow the steam out of the said record-chamber, complete the production of the phonographic record, and finally removing the record-cylinder, substantially as described.

3. The process of producing phonographic records, which consists in placing a blank record-cylinder within and adjacent to the indented record-surface of a cylindrical matrix and closing the ends of the record-cylinder so as to provide an interior chamber, next furnishing a supply of steam under pressure to such chamber and permitting it to blow through so as to prevent or minimize the condensation of the steam, furnishing a supply of air under pressure to complete the production of the record, and finally removing the record-cylinder, substantially as described.

4. The process of producing records of the class described, which consists in placing a blank record-cylinder adjacent to the mold-surface of a matrix in position to provide an outlet-opening communicating with the space between the record-cylinder and the matrix, then closing the ends of the record-cylinder without closing the opening communicating with the space between the record-cylinder and matrix, then applying fluid under pressure within and heat to the record-cylinder, and then applying a cool fluid to the record-cylinder, and then removing the record-cylinder, substantially as described.

5. The process of producing records of the class described, which consists in placing a blank record-cylinder adjacent to the mold-surface of a matrix in position to provide an outlet-opening communicating with the space between the record-cylinder and the matrix, then closing the ends of the record-cylinder without closing the opening communicating with the space between the record-cylinder and matrix, then applying steam under pressure within the record-cylinder, and then applying a cool fluid to the record-cylinder, and then removing the record-cylinder, substantially as described.

6. The process of producing records of the class described, which consists in placing a blank record-cylinder adjacent to the mold-surface of a matrix in position to provide an outlet-opening communicating with the space between the record-cylinder and matrix, then closing the ends of the record-cylinder with-

out closing the space between the record-cylinder and matrix, then furnishing a supply of cool fluid under pressure to complete the production of the record, and finally removing the record-cylinder, substantially as described.

7. The process of producing records, which consists in placing a blank record-cylinder adjacent to the inner indented surface of a cylindrical matrix, then passing into the chamber formed inside the record-cylinder a supply of steam under pressure, furnishing a supply of cool fluid under pressure to blow the steam out of the said record-chamber, complete the production of the phonographic record, and finally removing the record-cylinder, substantially as described.



surface of the record has been softened and indentations of the machine forming a supply of cool fluid to complete the production and finally removing the record substantially as described.

producing duplicate phonographic records, which consists in placing a record-blank adjacent to the mold-surface of the matrix, then arranging a movable head adjacent to the record-blank so as to form in combination with such blank a chamber without closing the opening communicating with the space between the record-blank and matrix, then applying fluid under pressure within the chamber to complete the production of the record, and finally removing the record, substantially as described.

producing records of the class described that consists in placing a blank record-cylinder adjacent to the mold-surface of a matrix, supplying heated fluid against the exposed surface of the blank record-cylinder until such cylinder has been softened, then furnishing a supply of cool fluid under pressure to said cylinder to complete the duplication of the record and finally removing the record-cylinder, substantially as described.

producing records of the class described that consists in placing a blank record-cylinder adjacent to the mold-surface of a matrix, supplying heated fluid against the exposed surface of the blank record-cylinder until such cylinder has been softened, then furnishing a supply of cool fluid under pressure to said cylinder to complete the duplication of the record and finally removing the record-cylinder, substantially as described.

out closing the opening communicating with the space between the record-cylinder and matrix, then applying fluid under pressure to the record-cylinder and then removing the record-cylinder, substantially as described.

7. The process of producing phonographic records, which consists in placing a record-blank adjacent to the mold-surface of the matrix in position to provide an outlet-opening communicating with the space between the record-blank and the matrix, then arranging a movable head adjacent to the record-blank so as to form in combination with such blank a chamber without closing the opening communicating with the space between the record-blank and matrix, then applying fluid under pressure within the chamber to complete the production of the record,

and then removing the record, substantially as described.

8. The process of duplicating records of the class described that consists in placing a blank record-cylinder adjacent to the record-surface of a matrix, supplying heated fluid against the exposed surface of the blank record-cylinder until such cylinder has been softened, then furnishing a supply of cool fluid under pressure to said cylinder to complete the duplication of the record and finally removing the record-cylinder, substantially as described.

THOMAS B. LAMBERT.

Witnesses:

THOMAS F. SHERIDAN,  
BRIAN F. PHILPOT.









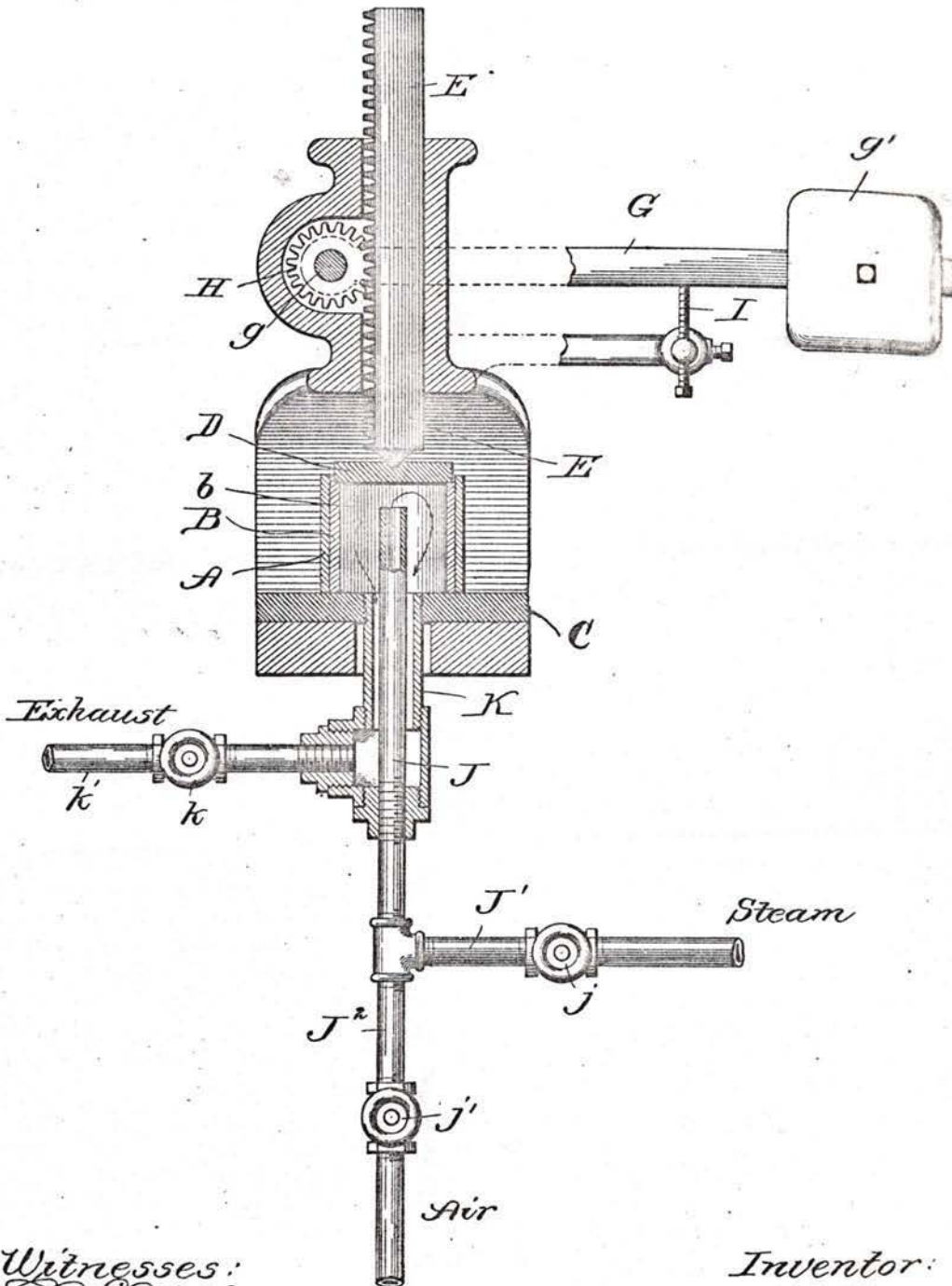
No. 742,455.

PATENTED OCT. 27, 1903.

T. B. LAMBERT.  
APPARATUS FOR REPRODUCING PHONOGRAPHIC RECORDS.

APPLICATION FILED JUNE 14, 1900.

NO MODEL.



Witnesses:  
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Inventor:  
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Att'y.

No. 742,4

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ED OCT. 27, 1903.

RECORDS.

No. 742,455.

Patented October 27, 1903.

# UNITED STATES PATENT OFFICE.

THOMAS B. LAMBERT, OF CHICAGO, ILLINOIS, ASSIGNOR TO LAMBERT COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## APPARATUS FOR REPRODUCING PHONOGRAPHIC RECORDS.

SPECIFICATION forming part of Letters Patent No. 742,455, dated October 27, 1903

Application filed June 14, 1900. Serial No. 20,285. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS B. LAMBERT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Producing Duplicate Phonographic Records, of which the following is a specification.

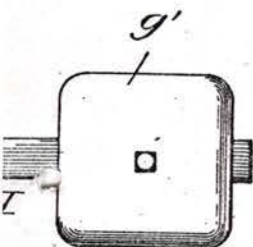
This invention relates particularly to the processes by which the ordinary record now used in connection with phonographs may be duplicated any number of times, and especially to the reproduction of indestructible records, all of which will more fully hereinafter appear.

The principal object of the invention is to provide a simple, economical, and efficient apparatus for producing duplicate phonographic records; and the invention consists in the features, combinations, and details of construction hereinafter described and claimed.

The accompanying drawing represents a vertical sectional elevation of one style of an apparatus constructed in accordance with my improvements.

In constructing a machine in accordance with my improvements and using the same I provide a matrix A of the desired size, shape, and strength and which is preferably cylindrical in contour and formed of copper which has been electrochemically deposited upon a wax cylinder in the manner shown and described in Patent No. 645,920, issued to me the 20th day of March, 1900, and which it is therefore unnecessary to show and describe in detail here. The inner side of this copper matrix is provided, as is shown in the above-named patent, with a negative duplicate of a record-cylinder, and in order to make duplicates of the same I place within such matrix a blank record-cylinder B, formed of celluloid or similar substance. In fact, it can be formed of any substance which is susceptible of being softened by heat and rehardened by cooling. This blank record, which may be made of celluloid or other desirable material, is, as above stated, placed within the matrix, so that the record and matrix both rest upon a base C of the machine, which acts as a closure for one end of the record-

chamber b. A head portion D is next provided and placed upon the record-cylinder to complete the closure thereof. An air-tight chamber, which I will designate as the "record-chamber," is thus formed within the blank record-cylinder and between the movable head D and the base C. This movable head should be of such diameter as to leave an opening between it and the matrix when the head is in contact with the record-cylinder at a point within or near the matrix, and the opening should be narrower than the thickness of the record-cylinder. The opening will then be closed and sealed by the record-cylinder when pressure sufficient to expand it is applied within, and, as will be readily seen, this opening affords an outlet for the air to escape between the head and matrix and from between the record-cylinder and matrix. This arrangement of the head and matrix leaves the matrix to rest loosely upon the base without anything to hold it unyieldingly against the base. The natural irregularities of the adjacent surfaces of the matrix and base thus afford a sufficient opening between the lower end of the matrix and base to permit air to escape from between the record-cylinder and matrix. In fact, in the absence of anything to hold the matrix rigidly and unyieldingly against the base—such, for instance, as a head in unyielding contact with the opposite end of the matrix—the application of the pressure within the record-cylinder will force the air from between the record-cylinder and base however regular their adjacent surfaces may be. The natural irregularities of the adjacent surfaces, however, insure a sufficient vent when the relation of the head and matrix is as described. A gear-spindle E, slidably arranged above the head, is allowed to drop down thereon. A weighted lever G is provided and mounted upon the shaft g, that carries a pinion H, which meshing with a rack e operates the spindle above named and in connection with a stop-screw I determines the position and the amount of pressure with which this spindle may rest on the head. It is now desirable to soften the record-cylinder, so that it may be expanded out against the record-surface of the



Steam

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matrix. In order to accomplish this, a fluid, preferably steam under about thirty pounds pressure to the square inch, is forced into the record-chamber through a pressure-supply pipe J, which is connected by means of a branch pipe J' with a suitable source of steam-supply. The steam is permitted to escape again out through an exhaust-pipe K, connected with the outer air by means of the branch K'. The steam is kept at a substantially uniform pressure within the record-chamber, so as to by means of its peculiar heating qualities and other actions soften the record and force it out against the inner indented surface of the matrix. After this has been accomplished, and experience teaches the operator just how long under certain pressure it takes steam to accomplish this result, the steam-supply is shut off by means of the valve j, and a supply of air under pressure is permitted to enter through the supply-pipe J by opening the valve j' on a second branch pipe J<sup>2</sup>, which connects with a source of air under pressure and keeps up practically the same pressure as heretofore, but leaving the valve k on the exhaust-pipe open, so that all moisture and steam are blown out of the cylinder formed by the record, as above described. When the steam has been blown out, the next step is to shut off the valve k and permit air under the desired pressure to stay in the record-chamber until such blank record is substantially forced into all the indentations made by the record on the inner surface of the copper matrix. As soon as this has been accomplished the air-supply is shut off, leaving just enough air inside the record-chamber to cool the same, and the exhaust-valve k is opened sufficiently to permit the air to blow through under certain pressure, and thus assist materially in cooling the record-cylinder. When the duplication of the record-cylinder has been completed, the spindle E is raised, the head D removed, and the matrix, with its duplicate record, removed from contact with the apparatus. The cooling of the record-cylinder also shrinks it, so that it can be easily removed from engagement with the matrix.

Whenever desirable or necessary, the outer periphery of the matrix may be backed by plaster-of-paris, having a lead or other metallic confining-ring to give it sufficient rigidity to secure the duplication or reproduction of the records, and this is very clearly shown and described in the patent above referred to.

I claim—

1. In an apparatus for producing records of the class described, the combination of a frame, a cylindrical matrix arranged therein, a base portion and a head portion arranged at each end of the matrix and adapted to hold a blank record-cylinder within the matrix, forming in connection with and within the record-cylinder an air-tight chamber and arranged to leave a passage for air adjacent to the matrix and outside of the record-cyl-

inder, and means for admitting fluid under pressure into the chamber within the record-cylinder, substantially as described.

2. In an apparatus for producing records of the class described, the combination of a frame, a cylindrical matrix arranged therein, a stationary base, and a movable head portion arranged at each end of the matrix and adapted to hold a blank record-cylinder within such matrix, forming in connection with and within the record-cylinder an air-tight chamber and arranged to also form adjacent to the matrix and outside of the record-cylinder a passage for the outlet of air from within the matrix, means for admitting fluid under pressure into the chamber within the record-cylinder, and means for holding the movable head in operative contact therewith, substantially as described.

3. In an apparatus for producing records of the class described, the combination of a frame, an open cylindrical matrix arranged therein provided with indentations upon its inner surface, a base portion and a head portion arranged at each end of the matrix and adapted to partially close the same and hold a blank record-cylinder within such matrix in position to be operated upon and also forming in connection with and within such record-cylinder an air-tight chamber, means for admitting heated fluid under pressure into the chamber within the record-cylinder, means for permitting such fluid to escape, and means for admitting cool fluid within such chamber, substantially as described.

4. In an apparatus for producing records of the class described, the combination of a cylindrical matrix, a base portion, and a head portion arranged at the ends of the matrix and adapted to hold a blank record-cylinder within the matrix and close the ends of such cylinder forming in connection therewith a closed interior chamber, one of such inclosing end portions being out of contact with the matrix, substantially as described.

5. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix, a base portion arranged at one end thereof and in contact with the end of a blank record-cylinder to be operated upon, a head portion arranged in contact with the other end of the blank record-cylinder and in connection with such cylinder and the base forming a chamber within the record-cylinder, and means for furnishing a supply of fluid under pressure into the chamber, substantially as described.

6. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix, a base portion arranged at one end thereof and in contact with the end of a blank record-cylinder to be operated upon, a head portion in contact with the other end of the blank record-cylinder and in connection with such cylinder and the base forming a chamber within the record-cylinder, and a pipe communicating with such

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admission of fluid under pressure thereto,  
substantially as described.

7. In an apparatus for producing records of  
5 the class described, the combination of an  
open cylindrical matrix, a base portion ar-  
ranged at one end thereof and in contact with  
the end of a blank record-cylinder to be op-  
erated upon, a head portion arranged in con-  
10 tact with the other end of the blank record-  
cylinder and adapted to form an outlet-pas-  
sage communicating with the space between  
the record-cylinder and matrix and form in  
connection with the record-cylinder and base  
15 a chamber within such cylinder, means for  
holding the head in engagement with the re-  
cord-cylinder, and means for furnishing a sup-  
ply of fluid under pressure to the chamber,  
substantially as described.

8. In an apparatus for producing records of  
the class described, the combination of an  
open cylindrical matrix, a base portion ar-  
ranged at one end thereof and in contact with  
the end of a blank record-cylinder to be op-  
erated upon, a head portion arranged in con-  
15 tact with the other end of the blank record-  
cylinder and adapted to form an outlet-pas-  
sage communicating with the space between  
the record-cylinder and matrix and form in  
connection with the record-cylinder and base  
a chamber within such cylinder, a spindle op-  
erating against the head portion to hold it in  
engagement with the record, and a pipe lead-  
ing into one end of the chamber for furnish-  
20 ing a supply of fluid under pressure, substan-  
tially as described.

9. In an apparatus for producing records of  
the class described, the combination of an  
open cylindrical matrix, a base portion ar-  
ranged at one end thereof and in contact with  
the end of a blank record-cylinder to be op-  
erated upon, a head portion arranged in con-  
20 tact with the other end of the blank record-  
cylinder and adapted to form an outlet-pas-  
sage communicating with the space between  
the record-cylinder and matrix and form in  
connection with the record-cylinder and base  
a chamber within such cylinder, means for  
holding the head in engagement with the re-  
cord-cylinder independently of the matrix, a  
pipe communicating with such chamber and  
forming a passage for the admission of fluid  
under pressure thereto, and an exhaust-pipe  
also communicating with such chamber to per-  
25 mit the fluid to escape therethrough, substan-  
tially as described.

10. In an apparatus for producing records  
of the class described, the combination of an  
open cylindrical matrix, a base portion ar-  
ranged at one end thereof and in contact with  
the end of a blank record-cylinder to be op-  
erated upon, a head portion arranged in con-  
30 tact with the other end of the blank record-  
cylinder and adapted to form an outlet-pas-  
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the record-cylinder and matrix and form in  
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a chamber within such cylinder, means for  
holding the head in engagement with the  
record-cylinder independently of the matrix, 70  
a supply-pipe for furnishing steam under  
pressure to one end of the record-chamber,  
an exhaust-pipe connected with the record-  
chamber for permitting the steam to blow  
therethrough and exhaust therefrom, and a 75  
branch pipe connected with the supply-pipe  
for furnishing a supply of air under pressure  
to the record-chamber, substantially as de-  
scribed.

11. In an apparatus for producing records 80  
of the class described, the combination of an  
open cylindrical matrix provided with sound-  
record indentations thereon, a base portion  
arranged at one end thereof and in contact  
with the end of the blank record-cylinder to 85  
be operated upon, a movable head portion  
arranged in contact with the other end of the  
blank record-cylinder and adapted to form  
an outlet communicating with the space be-  
tween the record-cylinder and matrix and in 90  
connection with such cylinder and the base  
forming a chamber within such record-cyl-  
inder, and a pipe arranged to communicate  
with the chamber and form a passage for the  
admission of fluid under pressure thereto, 95  
substantially as described.

12. In an apparatus for producing records  
of the class described, the combination of an  
open cylindrical matrix provided with sound-  
record indentations thereon, a base portion 100  
arranged at one end thereof and in contact  
with the end of the blank record-cylinder to  
be operated upon, a movable head portion  
arranged in contact with the other end of the  
blank record-cylinder and adapted to form 105  
an outlet communicating with the space be-  
tween the record-cylinder and matrix and in  
connection with such cylinder and the base  
forming a chamber within such record-cyl-  
inder, a pipe arranged to communicate with 110  
such chamber and form a passage for the ad-  
mission of steam under pressure thereto,  
means for exhausting steam from the cham-  
ber, and means for furnishing a supply of  
cool fluid to such chamber, substantially as de- 115  
scribed.

13. In an apparatus for producing records  
of the class described, the combination of an  
open cylindrical matrix, a base portion ar-  
ranged at one end thereof and in contact 120  
with the end of a blank record-cylinder to be  
operated upon, the head portion arranged in  
contact with the other end of the blank re-  
cord-cylinder and provided with means for  
holding the end of such cylinder in operative 125  
contact with such head while such end is out  
of contact with the matrix and, in connec-  
tion with such cylinder and the base, form-  
ing a chamber within the record-cylinder,  
and means for furnishing a supply of fluid 130  
under pressure into the chamber, substan-  
tially as described.

14. In an apparatus for producing records  
of the class described, the combination of an



open cylindrical matrix, a base portion arranged at one end thereof and in contact with the end of a blank record-cylinder to be operated upon, a head portion in contact with the other end of the blank record-cylinder and, in connection with such cylinder and the base forming a chamber within the record-cylinder, means for holding each of the ends of such cylinder in operative contact with the cylinder-holding end portion while such cylinder end is out of contact with the matrix, and a pipe communicating with such chamber adapted to form a passage for the admission of fluid under pressure thereto, substantially as described.

15. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix, a base portion arranged at one end thereof and in contact with the end of a blank record-cylinder to be operated upon, a head portion arranged in contact with the other end of the blank record-cylinder and adapted to form an outlet-passage communicating with the space between the record-cylinder and matrix and form in connection with the record-cylinder and base an innermost chamber within such cylinder, means for holding the head in engagement with the record-cylinder independently of the matrix, and means for furnishing a supply of fluid under pressure to the chamber, substantially as described.

16. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix provided with sound-record indentations thereon, a base portion arranged at one end thereof and in contact with the end of the blank record-cylinder to be operated upon, a movable head portion arranged in contact with the other end of the blank record-cylinder and out of contact with the matrix and forming in connection with the base and cylinder a chamber, such head portion being provided with means for holding the end of such cylinder in operative contact with the head independently of the matrix to form a temporary passage between the cylinder and matrix, and a pipe arranged to communicate with the chamber and form a passage for the admission of fluid under pressure thereto, substantially as described.

17. In an apparatus for producing records of the class described, the combination of an open cylindrical matrix provided with sound-record indentations thereon, a base portion arranged at one end thereof and in contact with the end of the blank record-cylinder to be operated upon, a movable head portion arranged in contact with the other end of the blank record-cylinder and, in connection with such cylinder and the base, forming a chamber within such record-cylinder, such head portion being provided with means for holding the end of the cylinder in operative contact with the head independently of the matrix, a pipe arranged to communicate with such chamber and form a passage for the ad-

mission of steam under pressure thereto, means for exhausting steam from the chamber, and means for furnishing a supply of cool fluid to such chamber, substantially as described.

18. In an apparatus for producing records of the class described, the combination of a base portion adapted to receive and hold an indented matrix, a matrix mounted upon such base and arranged to encircle the cylinder to be operated upon, means for forming a record-chamber in connection with the blank record, means for furnishing a supply of steam under pressure to the record-chamber, and means for furnishing a supply of air to the same chamber, substantially as described.

19. In an apparatus for producing records of the class described, the combination of a base portion adapted to receive and hold a cylindrical matrix containing a blank record-cylinder and close one end of the chamber formed within such record-cylinder, a matrix provided with indentations upon its inner surface, a head portion arranged to close the other end of the record-cylinder, means for holding the head in engagement with the record, and means for furnishing a supply of steam under pressure to the chamber formed by the record-blank, substantially as described.

20. In an apparatus for producing records of the class described, the combination of a base portion adapted to receive and hold a cylindrical matrix containing a blank record-cylinder and arranged to close one end of the chamber formed within such record-cylinder, a matrix provided with indentations upon its inner surface, a head portion for closing the other end of the record-cylinder, a spindle operating against the head portion to hold it in engagement with the record, and a pipe leading into one end of the cylindrical chamber for furnishing a supply of steam under pressure, substantially as described.

21. In an apparatus for producing records of the class described, the combination of a base portion adapted to receive and hold a cylindrical metallic matrix containing a blank record-cylinder and arranged to close one end of the record-chamber formed within such record-cylinder, a matrix provided with indentations upon its inner surface, a head portion for closing the other end of the record-cylinder, a spindle operating against the head portion to hold it in engagement with the record, a pipe leading into one end of the record-chamber for furnishing a supply of steam under pressure, and means for furnishing a supply of air to the cylindrical record-chamber above described, substantially as described.

22. In an apparatus for forming records of the class described, the combination of a base portion adapted to receive and hold a cylindrical matrix carrying a blank record and close one end of the chamber formed within the blank record-cylinder, a matrix provided

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pressure thereto, means for admitting a supply of fluid to the chamber formed within the record-cylinder, substantially as described.

22. In an apparatus for producing records of the class described, the combination of a base portion adapted to receive and hold a blank record-cylinder, a matrix mounted upon such base portion for closing the end thereof and adapted to support a matrix thereon, a head portion arranged at the other end of the blank record-cylinder for closing such end and forming in connection with the base and record-cylinder a chamber, and means for admitting fluid under pressure to such chamber, substantially as described.

23. In an apparatus for producing records of the class described, the combination of a base portion adapted to receive and hold a blank record-cylinder, a matrix mounted upon such base portion for closing the end thereof and adapted to support a matrix thereon, a head portion arranged at the other end of the blank record-cylinder for closing such end and forming in connection with the base and record-cylinder a chamber, and means for admitting fluid under pressure to such chamber, substantially as described.

24. In an apparatus for producing records of the class described, the combination of a base portion adapted to receive and hold a blank record-cylinder, a matrix mounted upon such base portion for closing the end thereof and adapted to support a matrix thereon, a head portion arranged at the other end of the blank record-cylinder for closing such end and forming in connection with the base and record-cylinder a chamber, and means for admitting fluid under pressure to such chamber, substantially as described.

25. In an apparatus for producing records of the class described, the combination of a base portion adapted to receive and hold a blank record-cylinder, a matrix mounted upon such base portion for closing the end thereof and adapted to support a matrix thereon, a head portion arranged at the other end of the blank record-cylinder for closing such end and forming in connection with the base and record-cylinder a chamber, and means for admitting fluid under pressure to such chamber, substantially as described.

26. In an apparatus for producing records of the class described, the combination of a base portion adapted to receive and hold a blank record-cylinder, a matrix mounted upon such base portion for closing the end thereof and adapted to support a matrix thereon, a head portion arranged at the other end of the blank record-cylinder for closing such end and forming in connection with the base and record-cylinder a chamber, and means for admitting fluid under pressure to such chamber, substantially as described.

with indentations on its inner surface, a head portion for closing the other end of the record-cylinder, a spindle arranged to contact the head portion, a weighted lever for operating the spindle and holding it at a predetermined pressure against the head, a pipe for furnishing a supply of steam under pressure to one end of the record-chamber, and an exhaust-pipe connected with the cylindrical record-chamber to permit the steam to blow therethrough and exhaust therefrom, substantially as described.

23. In an apparatus for forming records of the class described, the combination of a base portion adapted to receive and hold a cylindrical matrix and blank record-cylinder and close one end of the record-chamber formed within the blank record-cylinder, a matrix within which such cylinder is mounted, a head portion for closing the other end of the record-cylinder, a spindle arranged to contact the head portion, a weighted lever for operating the spindle and holding it at predetermined pressure against the head, a supply-pipe for furnishing a supply of steam under pressure to one end of the record-chamber, an exhaust-pipe connected with the record-chamber to permit the steam to blow therethrough and exhaust therefrom, and a branch pipe connected with the supply-pipe for furnishing a supply of air under pressure to the record-chamber, substantially as described.

24. In an apparatus of the class described, the combination of a matrix having a blank record-cylinder therein to be operated upon, a base portion arranged at one end of the blank record-cylinder and extending outward radially of such cylinder beyond the inner walls thereof, a head portion arranged at the other end of the blank record-cylinder and extending outward radially of such cylinder beyond the inner wall thereof to close the end of such cylinder for forming a pressure-chamber therein, and means for admitting fluid under pressure to such chamber, substantially as described.

25. In an apparatus of the class described, the combination of a base portion arranged at one end of a blank record-cylinder to close the end of such cylinder, a head portion movable independently of such base arranged at the other end of the blank record-cylinder to close such end and form in connection with the

base and cylinder a chamber, a matrix arranged outside of the record-cylinder, and means for admitting fluid under pressure to the chamber formed within the record-cylinder, substantially as described.

26. In an apparatus of the class described, the combination of a base portion arranged at one end of a blank record-cylinder to close the end thereof and adapted to support a matrix thereon, a matrix mounted upon such base outside of the record-cylinder, a head portion arranged at the other end of the blank record-cylinder for closing such end and forming in connection with the base and record-cylinder a chamber, and means for admitting fluid under pressure to such chamber, substantially as described.

27. In an apparatus of the class described, the combination of a base portion arranged at one end of a blank record-cylinder to close such cylinder, a matrix mounted upon such base and arranged to surround the cylinder, a head portion movable independently of the base arranged at the other end of the blank record-cylinder for closing such end and forming in connection with the base and record-cylinder a pressure-chamber, means for supplying heated fluid under pressure to such chamber, means for exhausting such fluid therefrom, and means for supplying cool fluid under pressure to such chamber, substantially as described.

28. In an apparatus of the class described, the combination of a base portion arranged at one end of a blank record-cylinder and extending outwardly radially of such cylinder beyond its inner wall to close the end thereof, a head portion movable independently of the base arranged at the other end of the blank record-cylinder and extending outward radially of such cylinder beyond its inner wall to close the end thereof for forming a pressure-chamber within such cylinder, means for admitting steam under pressure to such chamber, means for exhausting such steam therefrom, and means for admitting air under pressure thereto, substantially as described.

THOMAS B. LAMBERT.

Witnesses:

THOMAS F. SHERIDAN,  
BRIAN F. PHILPOT.





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PROVISIONAL SPECIFICATION.

Improvements in Phonographs.

I, HENRI JULES LIORET, of 187 Avenue du Maine, Paris, France Manufacturer, do hereby declare the nature of this invention to be as follows:—

The present invention relates to improvements in phonographs for the purpose of enabling these instruments to be manufactured at a low cost, and consequently render them applicable to numerous uses, such for example as in the manufacture of new toys.

These improvements relate in the first instance to the construction of the cylinder or roll serving to receive the impressions of the recording stylus or point which is carried by the vibrating plate in front of which one speaks; the improvements permit of such engraved cylinder being employed as a matrix for reproducing the same impressions a large number of times on other cylinders, which I call "reproduction-cylinders."

In the second place my improvements relate to the method of mounting these reproduction-cylinders.

In the third place they relate to the arrangement of the receiving stylus and the sounding box to which it is adapted, and finally to the arrangement of the motor mechanism in the phonographic apparatus.

In the annexed drawings:—

Fig. 1 is a view on an enlarged scale of part of a matrix cylinder.

Fig. 2 is a similar view showing the guiding of the stylus on the threads on the matrix cylinder.

Fig. 3 is a similar view of a part of the matrix cylinder and of the "reproduction-cylinder" which it enables to be obtained.

Figs. 4 to 8 represent the successive phases of the manufacture in celiuloid.

Fig. 9 represents a doll provided with my apparatus.

Fig. 10 is a section showing one method of mounting the cylinders in my system.

Fig. 11 is a similar view showing another method of mounting my cylinders.

Figs. 12, 13 and 14 illustrate one arrangement of a complete apparatus constructed according to my system.

Figs. 15, 16 and 17 show a second arrangement, and

Figs. 18, 19 and 20 a third arrangement.

The matrix cylinders are produced in the following manner: A sleeve of soft steel having a triangular screw thread of suitable fineness is taken and is placed in front of the recording stylus fixed to the vibrating plate before which speech is delivered; it being arranged so that the point of the stylus engraves its impressions successively along the point itself of the thread; it is at this point that the resistance to penetration is least, firstly on account of the small thickness of metal to be dealt with, and then on account of the absence of lateral frictional contact due to the adjacent surfaces, seeing that such surfaces do not exist at the point of the thread; the stylus can therefore act at this point with the greatest efficiency and cut away so to speak in the sharp point the impressions which it is to produce on the cylinder.

In order to receive the sonorous vibrations the screw threaded sleeve is keyed on a shaft which terminates in a screw of the same pitch engaging a nut. In front of the sleeve thus mounted a suitable recording phonographic system is arranged, such for example as a vibrating diaphragm provided with a stylus, and care is taken that the point of the stylus bears on the point of the thread of the sleeve.

[Price 8d.]



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If then the shaft of the sleeve is caused to turn in front of the stylus, and speech is delivered in front of the diaphragm, the stylus will engrave along the point of the thread impressions of the form and depth corresponding to the nature of the sonorous vibrations.

When once the sleeve is thus engraved it is tempered, and a cylinder is thus obtained which may be employed as it is for causing the diaphragm of the receiving instrument to vibrate and reproduce the sounds which have been made in front of it.

This first feature of my invention is illustrated in Fig. 1 of the accompanying drawing, which shows, on a greatly enlarged scale, a portion of the screw threaded sleeve *a* partly in longitudinal section and partly in elevation, showing the impressions *b* cut out in the point of its thread by the recording stylus.

When the matrix cylinder *a* is employed directly for causing the receiver to speak, the receiving stylus *d*, of which the blunt point must rest on the point of the thread (Fig. 2), carries an additional lateral point *d'*, which engages the hollow of the thread so as to be thus guided and cause the receiving stylus to advance naturally and by itself without there being any necessity to use a screw or other mechanism to effect this, and this further no matter what the pitch of the thread of the cylinder employed may be.

One might also employ a stylus with a widened point hollowed in the form of a crescent so as to embrace the point of the thread, while at the same time only resting on it at a point (Fig. 2). It has been shown how the cylinder engraved on the points of its thread, then tempered, may be employed directly for causing the receiving instrument to actuate; its great durability will thus ensure the advantage of a very long life, which is quite new.

But as above stated it may be also employed as a matrix or mould for reproducing directly a large number of times, and consequently in a very economical manner, upon other cylinders of soft metal or other suitable material, impressions which will serve to place the diaphragm of the receiving instrument in vibration; it is these which I designate under the name of "reproduction-cylinders."

When it is desired to obtain a cylinder of soft metal or other analogous material, this may be effected directly by simply causing the matrix to roll under suitable pressure upon a cylinder of such material of the same diameter (Fig. 3), or upon a band of suitable profile which is afterwards wound upon a roller. The reproduction-cylinder preferably bears a screw of the same pitch as that of the matrix cylinder, so that the impressions engraved on the point or summit of the thread of the latter will be reproduced in the base of the thread of the reproduction-cylinder (Fig. 3); the band may also present scores or channels which, when the ribbon is rolled round a roller will form a thread, and, in this case, the impressions will still be reproduced at the bottom of the scores or channels.

In fact these impressions will be the counterpart of those of the matrix cylinder, but this is unimportant from the point of view of the reproduction of the sounds.

It will be understood that when use is made in the receiver of a reproduction-cylinder *c* like that just described, the receiving stylus may be guided simply by causing its point to rest in the hollow of the thread.

It will be seen (Fig. 3) that the thread of the reproduction-cylinder *c* is of less depth than that of the matrix cylinder *a*, in order to facilitate the reproduction; this thread need not be more than sufficient for guiding the stylus.

When the reproduction-cylinders are not required to be so durable, instead of making them of soft metal or other analogous material they may be made of celluloid: this material presents the advantage of keeping impressions well, of not being liable to break, and above all of not being materially affected by atmospheric variations.

Further, although very homogeneous and very hard, it cuts and moulds sharply and wears away slowly.

The following is the method of operation: The matrix cylinder *a* (Fig. 4) is



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prepared as I have above indicated, then, as shown in Fig. 5, I take a galvano-plastic mould  $a^1$ , which consequently presents the form of a tube bearing on its inner surface the counterpart of the screw thread and of the impressions of the matrix cylinder  $a$  (Fig. 6). Then into this tube is introduced a celluloid sleeve  $c$  (Fig. 7) just big enough to enter same freely, and the whole is plunged into warm water; the celluloid then softens, and a mandrel  $a^2$  sufficiently large to expand it and cause the material to penetrate into the hollows of the tube is forced therein (Fig. 8). It is then plunged into cold water and the celluloid again hardens, at the same time contracting sufficiently to enable the sleeve  $c$  to be easily withdrawn from the tube  $a$ . This sleeve thus finally becomes a reproduction-cylinder  $c$  which is the exact reproduction of the matrix cylinder  $a$ .

This method is rapid and economical, and produces perfect results.

It will be further understood that according to whether the impressions have been engraved at the point or at the bottom of the screw thread of matrix  $a$ , the cylinder  $c$  will bear also the impression at the point or in the bottom of its thread; and that consequently the receiving stylus will have to be correspondingly arranged.

In the following description, which is given as an example, I shall imagine the phonograph as being arranged in the body of a doll as shown in Fig. 9, but it will be understood that it may be applied in any other manner.

Further, no matter what the application be, the cylinder  $c$ , obtained by one of the means I have above indicated, may be applied to a disc  $G$  (of wood for example), which passes freely onto a fixed shaft  $F$ ; this shaft is carried by a bracket  $E$  fixed to a base  $D$  (Fig. 10): it also receives a loose pulley  $J^3$  carrying a pin  $j$  which enters a hole in the disc  $G$  so as to carry the cylinder  $c$  with it in its movement. A hinged spring arm  $M$  can be turned down to enable the disc  $G$  to be placed on the shaft, and retain same in place when it is raised. When however the cylinder  $c$  is of celluloid, I prefer to mount same in a different manner, as shown in Fig. 11, where such cylinder is held between two thin discs  $c^1$  forming cheeks and presenting centreing ribs  $c^2$ ; these two discs are maintained at the required distance apart by a wooden sleeve  $G$  to which they are nailed. The whole cylinder thus formed is simply placed on the shaft  $F$ .

With regard to the mechanism for driving the cylinder, same may be greatly varied, but in all cases same is characterized by the fact that the motive power does not act directly on the shaft  $F$  of the cylinder  $c$ , but on an intermediate shaft  $C^1$  (Figs. 12 to 20), connected to the former by an elastic transmission, such as a band of india rubber  $J^2$ . The principal advantage of this arrangement is that the elastic band will allow the pulley to readily slip to a certain extent (without however abandoning same entirely) when the cylinder  $c$ , which is of relatively considerable weight, acts as a fly wheel to correct the unavoidable inequalities in the speed of the motor shaft, more particularly if it is actuated by hand.

In my apparatus, the receiving stylus with blunt point  $H$  is fixed to or formed on the extremity of a horizontal arm  $H^1$  secured under the lower wall of a cylindrical sounding box  $I$  of any suitable material, in such a way that the stylus is rigidly fixed under the centre of this box; the arm which the box carries is mounted freely on an axis of oscillation  $H^3$  carried by a pillar  $H^2$ , by which means by turning round this axis the whole arrangement formed by the box and the stylus rests freely upon the cylinder by its own weight and will be sensibly displaced in the direction of the generating line of the cylinder, in the screw thread of which, as has been above pointed out, the stylus is always guided. For greater simplicity, the stylus, the arm which carries it, and the support of the box, may be constituted as shown in the drawings by a simple and the same metallic wire, preferably of steel, which, after forming a loop round the axis  $H^3$ , is carried round the box  $I$ , then is bent back to form the arm  $H^1$ , and finally is curved and pointed so as to constitute the stylus  $H$ .

With regard to the pillar  $H^2$ , this is simply placed in position by causing it to engage a hole in the base  $D$ . With the object of ensuring a better contact between



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the stylus and the cylinder, the metallic wire which carries the resonator and which forms the stylus is constantly drawn downwards by means of an elastic band  $H^4$  or other tension spring, one end of which is attached to a fixed point. Further, the metallic wire forms a bend  $h$ , which, being guided under a suitably arranged rod  $h^1$  prevents the resonator  $I$  and the stylus  $H$  from accidentally moving away from the cylinder to an exaggerated extent, as when the apparatus receives a shake for example.

The box  $I$  serving as a resonator is preferably perforated, at its upper surface, with a hole to receive the end of a trumpet or bell for facilitating the dispersion of the sound. When the cylinder turns in the required direction for causing the apparatus to speak, the stylus freely follows the thread of the cylinder, and when it arrives at the end of this cylinder it is only necessary to carry it back to the other end in order to enable the apparatus to again operate.

The phonographic apparatus thus arranged may be actuated by hand or by a clockwork movement, Figs. 12 and 14 illustrating an arrangement in which the operation is effected directly by acting by hand on a crank  $C$ . For this purpose the shaft  $C^1$  of the crank carries a pulley  $J$ , which is connected by an elastic band  $J^2$  to the pulley  $J^3$ , mounted loosely on the fixed shaft  $F$ , and actuating the cylinder by means of the pin  $j$ . This crank  $C$ , instead of being keyed on the shaft  $C^1$ , is carried by a split bush or sleeve  $L$  mounted on a slightly conical part of the shaft  $C^1$ . A nut  $L^1$  permits the sleeve to be forced on the shaft to a smaller or greater extent and thereby regulate the binding or adherence between these parts. On the other hand a regulating flyer is connected to the shaft  $C^1$  by an accelerating transmission.

As the resistance offered by the air to the movement of this flyer increases with the speed, there is a speed of rotation of the crank  $C$  at which such resistance is equal to the force of adherence of sleeve  $L$  on the shaft  $C^1$ .

If this limit is exceeded the resistance opposed to the movement of transmission by the flyer  $K$  becomes greater than the force of adherence of sleeve  $L$ , and the latter slips on shaft  $C^1$ , which always maintains a constant speed corresponding to the limit speed.

Figs. 15 to 17 show an arrangement in which the drum is actuated by a spring clock work movement, which is rewound by means of the key  $C$ . In the transmission, as in the preceding case, a regulating flyer  $K$  is interposed.

I employ a very simple arrangement for starting and stopping the clock work movement: It consists in the employment of a movable rod  $N$  mounted on the base  $D$  so that it is able to slide from the front backwards when actuated by means of the extension  $m$ , suitably guided according to circumstances. When, after being rewound, the rod has been moved to the position indicated in the drawing, the clock work movement will operate, because the flyer  $K$  will move freely without coming into contact with such rod; but on the other hand it is impossible to rewind the movement, because the key  $C$  in turning will be arrested by the extension  $m$  of the rod. If on the contrary the latter is pushed inwards, the rewinding can be effected, but the transmission is arrested because the flyer in revolving comes in contact with the rod and is arrested thereby.

Figs. 18 to 20 show a simpler arrangement in which the barrel of the clock work movement is replaced by a simple spring  $N$ , one of the ends of which is attached to a fixed point  $n$ , and the other end is fixed to the motor shaft  $C^1$ . To effect the rewinding it is only necessary to pull the cord  $C$ , which is rolled round a drum keyed to the shaft  $C^1$ , thus causing such shaft to turn in the required direction to place the spring in tension. During this movement the transmission does not operate, because the gear wheel  $C^2$  is loose on the motor shaft, and the pawl  $O$  which it carries can slip over the ratchet wheel  $O^1$ , keyed on to the shaft  $C^1$ . But when the cord is released the spring tends to cause the motor shaft to turn in the opposite direction; the ratchet wheel  $O^1$  then carries the wheel  $C^2$  with it and consequently operates the whole of the transmission. Further, the speed of this movement is regulated by the flyer  $K$ .

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As above mentioned, in the examples shown, I have imagined the phonographic apparatus to be placed in the cavity A formed inside the body B of a doll (Fig. 9); it is therefore arranged so that the crank C may be actuated, or the clock work movement rewound by means of the key or the cord, from the outside. It will be readily understood that one or more of the walls of the cavity A should be very thin, and even pierced with holes, so as not to present an obstacle to the dispersion of the sound.

Dated this 5th day of December 1893

ALLISON BROS.,  
Agents for the Applicant.

## COMPLETE SPECIFICATION.

## Improvements in Phonographs.

I, HENRI JULES LIORET, of 187 Avenue du Maine, Paris, France, Manufacturer, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to improvements in phonographs for the purpose of enabling these instruments to be manufactured at a low cost, and consequently render them applicable to numerous uses, such for example as in the manufacture of new toys.

These improvements relate in the first instance to the construction of the cylinder or roll serving to receive the impressions of the recording stylus or point which is carried by the vibrating plate in front of which one speaks; the improvements permit of such engraved cylinder being employed as a matrix for reproducing the same impressions a large number of times on other cylinders, which I call "reproduction-cylinders."

In the second place my improvements relate to the method of mounting these reproduction-cylinders.

In the third place they relate to the arrangement of the receiving stylus and the sounding box to which it is adapted, and finally to the arrangement of the motor mechanism in the phonographic apparatus.

In the drawings filed with the Provisional Specification and the additional sheet now filed with the present Specification:

Fig. 1 is a view on an enlarged scale of part of a matrix cylinder.

Fig. 2 is a similar view showing the guiding of the stylus on the threads on the matrix cylinder.

Fig. 3 is a similar view of a part of the matrix cylinder and of the "reproduction-cylinder" which it enables to be obtained.

Figs. 4 to 8 represent the successive phases of the manufacture in celluloid.

Fig. 8<sup>A</sup> shows the form of mandrel I prefer to employ for distending the celluloid sleeve.

Fig. 9 represents a doll provided with my apparatus.

Fig. 10 is a section showing one method of mounting the cylinders in my system.

Fig. 11 is a similar view showing another method of mounting my cylinders.

Figs. 12, 13 and 14 illustrate one arrangement of a complete apparatus constructed according to my system.

Figs. 15, 16 and 17 show a second arrangement, and

Figs. 18, 19 and 20 a third arrangement.

Figure 21 is a vertical section of the resonator I prefer to employ.

The matrix cylinders are produced in the following manner: A sleeve of soft steel having a triangular screw thread of suitable fineness is taken and is placed in



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front of the recording stylus fixed to the vibrating plate before which speech is delivered, it being arranged so that the point of the stylus engraves its impressions successively along the point itself of the thread: it is at this point that the resistance to penetration is least, firstly on account of the small thickness of metal to be dealt with, and then on account of the absence of lateral frictional contact due to the adjacent surfaces, seeing that such surfaces do not exist at the point of the thread; the stylus can therefore act at this point with the greatest efficiency and cut away so to speak in the sharp point the impressions which it is to produce on the cylinder.

In order to receive the sonorous vibrations the screw threaded sleeve is keyed on a shaft which terminates in a screw of the same pitch engaging a nut. In front of the sleeve thus mounted a suitable recording phonographic system is arranged, such for example as a vibrating diaphragm provided with a stylus, and care is taken that the point of the stylus bears on the point of the thread of the sleeve. If then the shaft of the sleeve is caused to turn in front of the stylus, and speech is delivered in front of the diaphragm, the stylus will engrave along the point of the thread impressions of the form and depth corresponding to the nature of the sonorous vibrations.

When once the sleeve is thus engraved it is tempered, and a cylinder is thus obtained which may be employed as it is for causing the diaphragm of the receiving instrument to vibrate and reproduce the sounds which have been made in front of it.

This first feature of my invention is illustrated in Fig. 1 of the accompanying drawing, which shows, on a greatly enlarged scale, a portion of the screw threaded sleeve *a* partly in longitudinal section and partly in elevation, showing the impressions *b* cut out in the point of its thread by the recording stylus.

When the matrix cylinder *a* is employed directly for causing the receiver to speak, the receiving stylus *d*, of which the blunt point must rest on the point of the thread (Fig. 2), carries an additional lateral point *d'*, which engages the hollow of the thread so as to be thus guided and cause the receiving stylus to advance naturally and by itself without there being any necessity to use a screw or other mechanism to effect this, and this further no matter what the pitch of the thread of the cylinder employed may be.

One might also employ a stylus with a widened point hollowed in the form of a crescent so as to embrace the point of the thread, while at the same time only resting on it at a point (Fig. 2). It has been shown how the cylinder engraved on the points of its thread, then tempered, may be employed directly for causing the receiving instrument to actuate: its great durability will thus insure the advantage of a very long life, which is quite new.

But as above stated it may be also employed as a matrix or mould for reproducing directly a large number of times, and consequently in a very economical manner, upon other cylinders of soft metal or other suitable material, impressions which will serve to place the diaphragm of the receiving instrument in vibration; it is these which I designate under the name of "reproduction-cylinders."

When it is desired to obtain a cylinder of soft metal or other analogous material, this may be effected directly by simply causing the matrix to roll under suitable pressure upon a cylinder of such material of the same diameter (Fig. 3), or upon a band of suitable profile which is afterwards wound upon a roller. The reproduction cylinder preferably bears a screw of the same pitch as that of the matrix cylinder, so that the impressions engraved on the point or summit of the thread of the latter will be reproduced in the base of the thread of the reproduction-cylinder (Fig. 3); the band may also present scores or channels which, when the ribbon is rolled round a roller will form a thread, and, in this case, the impressions will still be reproduced at the bottom of the scores or channels.

In fact these impressions will be the counterpart of those of the matrix cylinder, but this is unimportant from the point of view of the reproduction of the sounds.



It will be understood that when use is made in the receiver of a reproduction-cylinder *c* like that just described, the receiving stylus may be guided simply by causing its point to rest in the hollow of the thread.

It will be seen (Fig. 3) that the thread of the reproduction-cylinder *c* is of less depth than that of matrix cylinder *a*, in order to facilitate the reproduction; this thread need not be more than sufficient for guiding the stylus.

When the reproduction-cylinders are not required to be so durable, instead of making them of soft metal or other analogous material they may be made of celluloid; this material presents the advantage of keeping impressions well, of not being liable to break, and above all of not being materially affected by atmospheric variations.

Further, although very homogeneous and very hard, it cuts and moulds sharply and wears away slowly.

The following is the method of operation: The matrix cylinder *a* (Fig. 4) is prepared as I have above indicated, then, as shown in Fig. 5, I take a galvanoplastic mould *a*<sup>1</sup>, which consequently presents the form of a tube bearing on its inner surface the counterpart of the screw thread and of the impressions on the matrix cylinder *a* (Fig. 6). Then into this tube is introduced a celluloid sleeve *c* (Fig. 7) just big enough to enter same freely, and the whole is plunged into warm water; the celluloid then softens, and a mandrel *a*<sup>2</sup> sufficiently large to expand it and cause the material to penetrate into the hollows of the tube is forced therein (Fig. 8). It is then plunged into cold water and the celluloid again hardens, at the same time contracting sufficiently to enable the sleeve *c* to be easily withdrawn from the tube *a*. This sleeve thus finally becomes a reproduction-cylinder *c* which is the exact reproduction of the matrix cylinder *a*.

In Fig. 8 the mandril *a*<sup>2</sup> which I employ for distending this celluloid sleeve *c* is shown in general outline. In practice I employ a radially distending mandril which is shown in Fig. 8<sup>A</sup>. It consists in a cylindrical sleeve of india rubber closed at the two ends by rigid plates *a*<sup>3</sup>, which are suitably connected together by bars or rods as shown. A tube *a*<sup>4</sup> permits air to be injected into the closed chamber thus formed. The sleeve *a*<sup>2</sup> is of slightly less diameter than the interior diameter of the celluloid sleeve; when, after having introduced it in the latter, air is injected, the sleeve *a*<sup>2</sup> distends radially, forcing the celluloid sleeve *c*<sup>1</sup> into the recesses of the mould *a*<sup>1</sup> by a pressure which is normal to the axis. There is therefore no longitudinal dragging of the material, but only radial distension, which permits the employment of very thin celluloid sleeves, and which consequently are well adapted to take an exact impression, and which render the removal very easy.

This method is rapid and economical, and produces perfect results.

It will be further understood that according to whether the impressions have been engraved at the point or at the bottom of the screw thread of matrix *a*, the cylinder *c* will bear also the impression at the point or in the bottom of its thread, and that consequently the receiving stylus will have to be correspondingly arranged.

In the following description, which is given as an example, I shall imagine the phonograph as being arranged in the body of a doll as shown in Fig. 9, but it will be understood that it may be applied in any other manner.

Further, no matter what the application be, the cylinder *c*, obtained by one of the means I have above indicated, may be applied to a disc *G* (of wood for example), which passes freely unto a fixed shaft *F*; this shaft is carried by a bracket *E* fixed to a base *D* (Fig. 10), it also receives a loose pulley *J*<sup>3</sup> carrying a pin *j* which enters a hole in the disc *G* so as to carry the cylinder *c* with it in its movement. A hinged spring arm *M* can be turned down to enable the disc *G* to be placed on the shaft, and retain same in place when it is raised. When however the cylinder *c* is of celluloid, I prefer to mount same in a different manner, as shown in Fig. 11, where such cylinder is held between two thin discs *c*<sup>1</sup> forming cheeks and presenting centring ribs *c*<sup>2</sup>: these two discs are, maintained at the required distance



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apart by a wooden sleeve G to which they are nailed. The whole cylinder thus formed is simply placed on the shaft F.

With regard to the mechanism for driving the cylinder, same may be greatly varied, but in all cases same is characterized by the fact that the motive power does not act directly on the shaft F of the cylinder c, but on an intermediate shaft C<sup>1</sup> (Figs. 12 to 20), connected to the former by an elastic transmission, such as a band of india rubber J<sup>2</sup>. The principal advantage of this arrangement is that the elastic band will allow the pulley to readily slip to a certain extent (without however abandoning same entirely) when the cylinder c, which is of relatively considerable weight, acts as a fly-wheel to correct the unavoidable inequalities in the speed of the motor shaft, more particularly if it is actuated by hand.

In my apparatus, the receiving stylus with blunt point H is fixed to or formed on the extremity of a horizontal arm H<sup>1</sup> secured under the lower wall of a cylindrical sounding box I of any suitable material, in such a way that the stylus is rigidly fixed under the centre of this box; the arm which the box carries is mounted freely on an axis of oscillation H<sup>3</sup> carried by a pillar H<sup>2</sup>, by which means by turning round this axis the whole arrangement formed by the box and the stylus rests freely upon the cylinder by its own weight and will be sensibly displaced in the direction of the generating line of the cylinder, in the screw thread of which, as has been above pointed out, the stylus is always guided. For greater simplicity, the stylus, the arm which carries it, and the support of the box, may be constituted as shown in the drawings by a simple and the same metallic wire, preferably of steel, which, after forming a loop round the axis H<sup>3</sup>, is carried round the box I, then is bent back to form the arm H<sup>1</sup>, and finally is curved and pointed so as to constitute the stylus H.

With regard to the pillar H<sup>2</sup>, this is simply placed in position by causing it to engage a hole in the base D. With the object of ensuring a better contact between the stylus and the cylinder, the metallic wire which carries the resonator and which forms the stylus is constantly drawn downwards by means of an elastic band H<sup>4</sup> or other tension spring, one end of which is attached to a fixed point. Further, the metallic wire forms a bend h, which, being guided under a suitably arranged rod h<sup>1</sup> prevents the resonator I and the stylus H from accidentally moving away from the cylinder to an exaggerated extent, as when the apparatus receives a shake for example.

The box I serving as a resonator is preferably perforated, at its upper surface, with a hole to receive the end of a trumpet or bell for facilitating the dispersion of the sound. As will be seen in Fig. 21 this box besides the two sounding diaphragms formed by the bottom and the cover, is preferably provided with a certain number, which is variable as desired, of intermediate sounding diaphragms i, pierced with holes like the upper diaphragm or cover, the diameter of these holes preferably increasing from the lower to the upper diaphragm. When the cylinder turns in the required direction for causing the apparatus to speak, the stylus freely follows the thread of the cylinder, and when it arrives at the end of this cylinder it is only necessary to carry it back to the other end in order to enable the apparatus to again operate.

The phonographic apparatus thus arranged may be actuated by hand or by a clockwork movement, Figs. 12 and 14 illustrating an arrangement in which the operation is effected directly by acting by hand on a crank C. For this purpose the shaft C<sup>1</sup> of the crank carries a pulley J, which is connected by an elastic band J<sup>2</sup> to the pulley J<sup>3</sup>, mounted loosely on the fixed shaft F, and actuating the cylinder by means of the pin j. This crank C, instead of being keyed on the shaft C<sup>1</sup>, is carried by a split bush or sleeve L mounted on a slightly conical part of the shaft C<sup>1</sup>. A nut L<sup>1</sup> permits the sleeve to be forced on the shaft to a smaller or greater extent and thereby regulate the binding or adherence between these parts. On the other hand a regulating flyer is connected to the shaft C<sup>1</sup> by an accelerating transmission.



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l, at its upper surface,  
mitating the dispersion  
es the two sounding  
rably provided with a  
sounding diaphragms *i*,  
iameter of these holes  
t. When the cylinder  
speak, the stylus freely  
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ated by hand or by a  
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C. For this purpose  
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t *F*, and actuating the  
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a slightly conical part  
the shaft to a smaller  
ice between these parts.  
ft *C*<sup>1</sup> by an accelerating

As the resistance offered by the air to the movement of this flyer increases with the speed, there is a speed of rotation of the crank *C* at which such resistance is equal to the force of adherence of sleeve *L* on the shaft *C*<sup>1</sup>.

If this limit is exceeded the resistance opposed to the movement of transmission by the flyer *K* becomes greater than the force of adherence of sleeve *L*, and the latter slips on shaft *C*<sup>1</sup>, which always maintains a constant speed corresponding to the limit speed.

Figs. 15 to 17 show an arrangement in which the drum is actuated by a spring clockwork movement, which is rewound by means of the key *C*. In the transmission, as in the preceding case, a regulating flyer *K* is interposed.

I employ a very simple arrangement for starting and stopping the clockwork movement: It consists in the employment of a movable rod *N* mounted on the base *D* so that it is able to slide from the front backwards when actuated by means of the extension *m*, suitably guided according to circumstances. When, after being rewound, the rod has been moved to the position indicated in the drawing, the clockwork movement will operate, because the flyer *K* will move freely without coming into contact with such rod, but on the other hand it is impossible to rewind the movement, because the key *C* in turning will be arrested by the extension *m* of the rod. If on the contrary the latter is pushed inwards, the rewinding can be effected, but the transmission is arrested because the flyer in revolving comes in contact with the rod and is arrested thereby.

Figs. 18 to 20 show a simpler arrangement in which the barrel of the clockwork movement is replaced by a simple spring *N*, one of the ends of which is attached to a fixed point *n*, and the other end is fixed to the motor shaft *C*<sup>1</sup>. To effect the rewinding it is only necessary to pull the cord *C*, which is rolled round a drum keyed to the shaft *C*<sup>1</sup>, thus causing such shaft to turn in the required direction to place the spring in tension. During this movement the transmission does not operate, because the gear wheel *C*<sup>2</sup> is loose on the motor shaft, and the pawl *O* which it carries can slip over the ratchet wheel *O*<sup>1</sup>, keyed on to the shaft *C*<sup>1</sup>. But when the cord is released the spring tends to cause the motor shaft to turn in the opposite direction; the ratchet wheel *O*<sup>1</sup> then carries the wheel *C*<sup>2</sup> with it and consequently operates the whole of the transmission. Further, the speed of this movement is regulated by the flyer *K*.

As above mentioned, in the examples shown, I have imagined the phonographic apparatus to be placed in a cavity *A* formed inside the body *B* of a doll (Fig. 9); it is therefore arranged so that the crank *C* may be actuated, or the clockwork movement rewound by means of the key or the cord, from the outside. It will be readily understood that one or more of the walls of the cavity *A* should be very thin, and even pierced with holes, so as not to present an obstacle to the dispersion of the sound.

Having now particularly described and ascertained the nature of the said invention, and in what manner the same is to be performed, I declare that what I claim is.

1. A phonographic cylinder consisting of a sleeve of a soft steel bearing a triangular screw thread, along the edge of which the phonographic impressions are engraved by a system of recording phonograph, after which the sleeve is suitably hardened or tempered, substantially as described.

2. In a phonograph, in combination with the cylinder described in the first claim, the stylus *d* with an additional guiding point *d*<sup>1</sup>, engaging the screw thread of the cylinder substantially in the manner and with the object indicated and as shown in Fig. 2 of the drawings.

3. In a phonograph, in combination with the cylinder described in Claim 1, the stylus *d* with an enlarged concave point bearing on the edge of the screw thread substantially in the manner and for the purpose indicated and as shown in Fig. 2 of the drawings.

4. The employment of the cylinder described in Claim 1 as a matrix for the



*Lioret's Improvements in Phonographs.*

purpose of obtaining reproducing cylinders for receiving phonographs, substantially as described.

5. The mode of constructing reproducing cylinders which consists in causing the matrix cylinder to revolve under a certain pressure upon a cylinder of the same diameter or upon a ribbon or strip of soft metal or other analogous material, 5 substantially as described and as shown in Fig. 3 of the drawings.

6. The method of constructing reproducing-cylinders which consists in making a matrix cylinder which receives the phonographic impressions either on the top of the screw thread or in the bottom of the screw thread, taking a galvano-plastic mould of the matrix cylinder, introducing into the tubular piece thus 10 obtained a sleeve of celluloid or other suitable material, softening this sleeve by the action of heat, then dilating or distending it so as to force it to penetrate into the recesses of the tubular piece, substantially as described and as shown in Figs. 4 to 8 of the drawings.

7. For distending a celluloid reproduction cylinder during its manufacture by 15 the process described in the preceding claim, the employment of a compressed air mandrel, which is radially extensible, constructed and operating substantially as described and as shown in Fig. 8<sup>A</sup> of the accompanying drawings.

8. As a new product, a phonographic cylinder formed of celluloid, substantially 20 as described.

9. The mounting of the cylinders of phonographs described in the preceding claims, which consists in placing them between two cheeks which present centring webs and which are maintained at a suitable distance apart by a sleeve to 25 which they are fixed, substantially as described and as shown in Fig. 11 of the drawings.

10. In combination with the cylinders of phonographs described in the preceding claims, the employment of a stylus provided with a resonator with which it constitutes a movable whole and mounted in such manner as to be able to freely follow the screw thread of the cylinder during the rotation of the latter, 30 substantially in the manner and for the purpose indicated.

11. The employment as a resonator of a box having one or more intermediate diaphragms between its bottom and its cover, substantially as described and as shown in the Fig. 21 of the accompanying drawings.

12. The mounting of the resonator carrying the stylus on an axis of oscillation around which it can turn freely so as to follow the thread of the cylinder during 35 the rotation of the latter, substantially as described and as shown in the drawings.

13. In combination with the whole formed by the stylus on the resonator which freely follows the screw thread of the cylinder, a guide rod *h*<sup>1</sup> which limits the movements of the stylus and of the resonator both in the direction of the axis and 40 perpendicularly to this direction, substantially as described and shown.

14. The combination with the cylinders of phonographs described in the preceding claims, of a driving mechanism with a regulating flyer connected to the cylinder by an elastic organ of transmission such as an india rubber strap, 45 substantially in the manner and for the purpose indicated.

15. In the driving mechanism described in the preceding claim, the employment 45 of an operating crank carried by a split arbor which is mounted on a conical part of the driving shaft and the position of which on this shaft is regulated by a binding nut, substantially in the manner and for the purpose indicated.

16. The general arrangement and details of driving mechanism with regulating flyer, substantially as described in the Specification and as represented in Figs. 12 50 to 20 of the accompanying drawings.

Dated this 5th day of September 1894.

ALLISON BROS.,  
Agents for the Applicant.





(3<sup>rd</sup> Edition.)

SHEET 1.



Fig. 9.

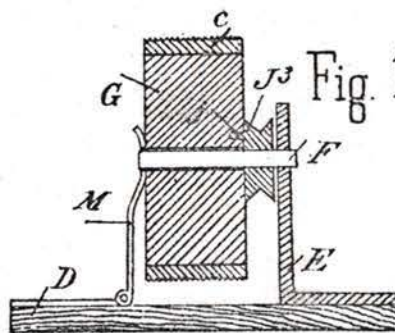


Fig. 10

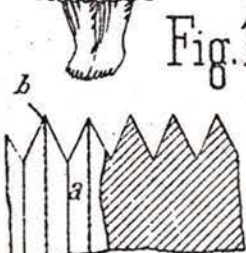


Fig. 1

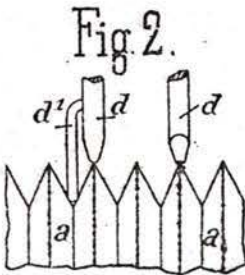


Fig. 2.

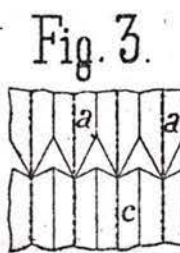


Fig. 3.

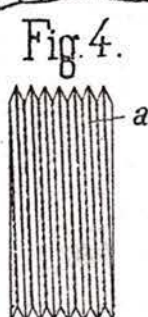


Fig. 4.

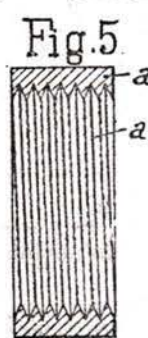


Fig. 5.



Fig. 6.

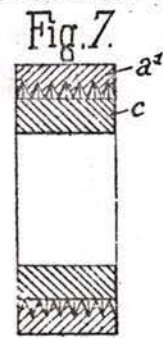


Fig. 7.

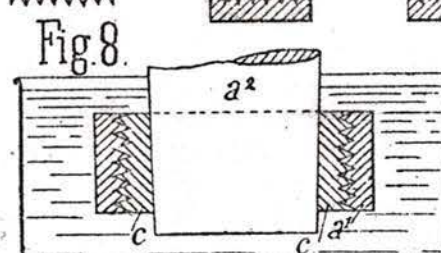
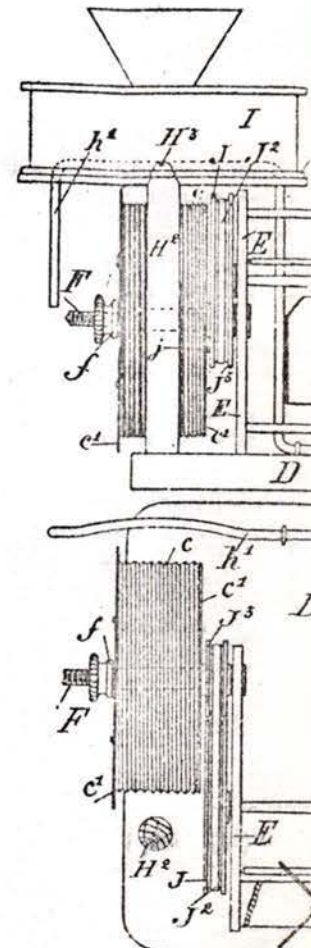


Fig. 8.

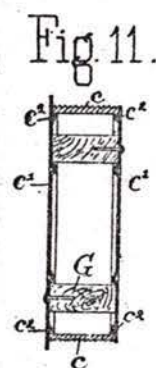
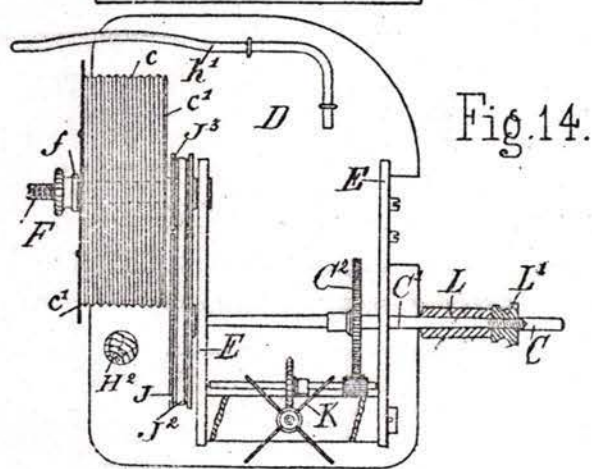
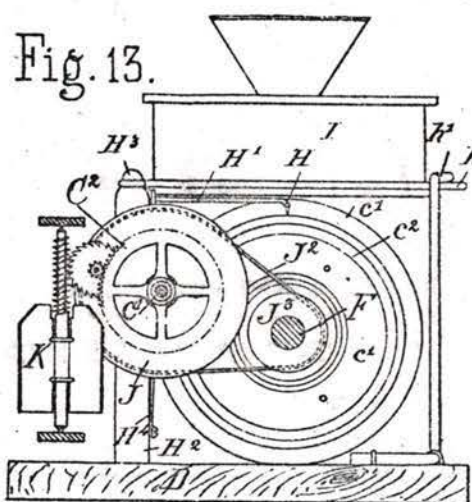
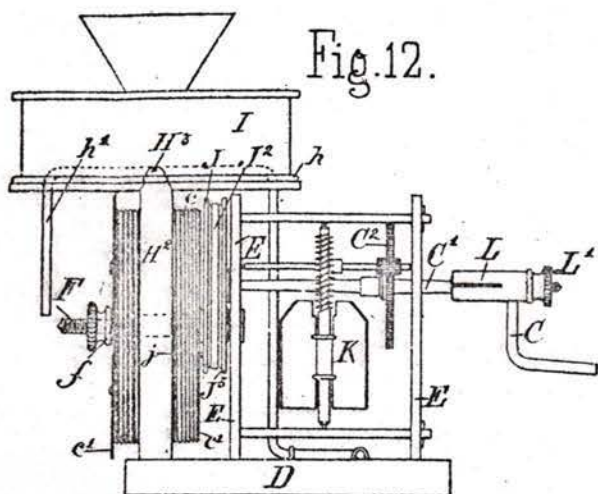


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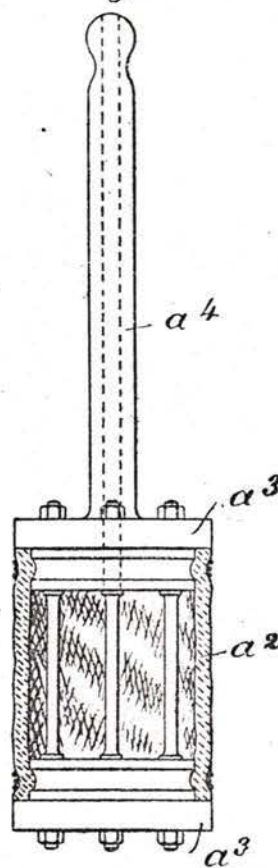
[This Drawing is a reproduction of the Original on a reduced scale.]



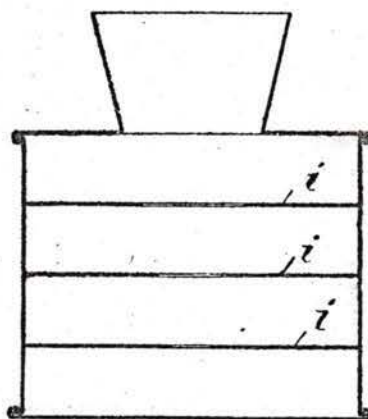


(3<sup>rd</sup> Edition)

*Fig. 8<sup>a</sup>*



*Fig. 21.*



[This Drawing is a reproduction of the Original on a reduced scale]





Fig. 15.

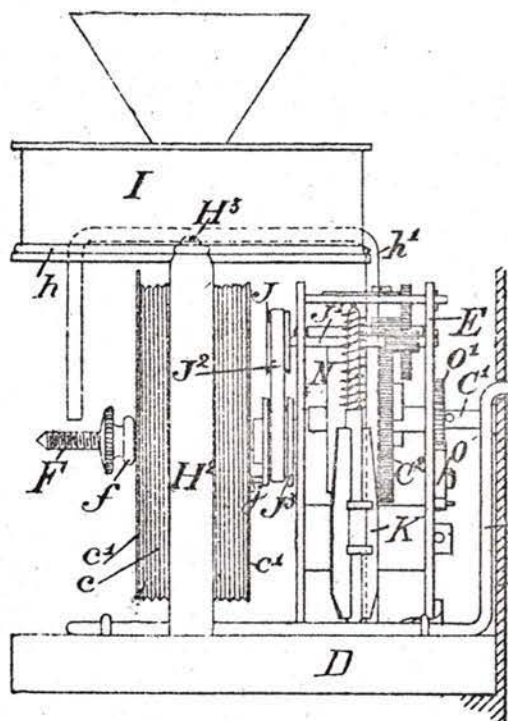


Fig. 16.

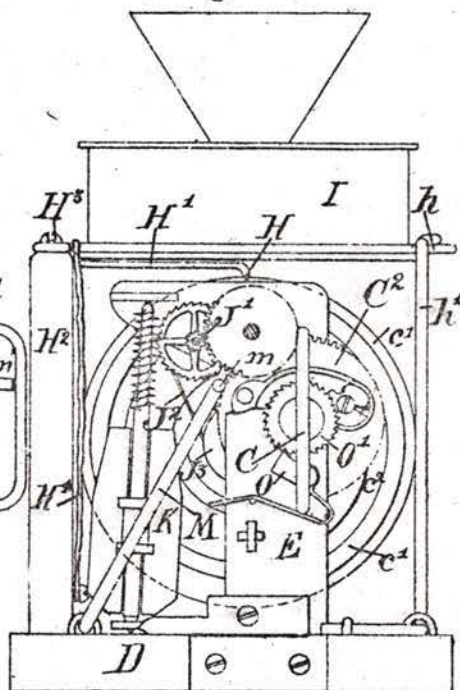


Fig. 17.

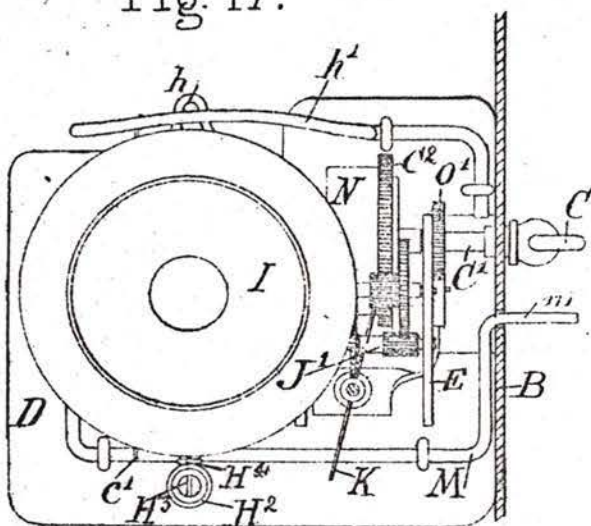


Fig. 16.

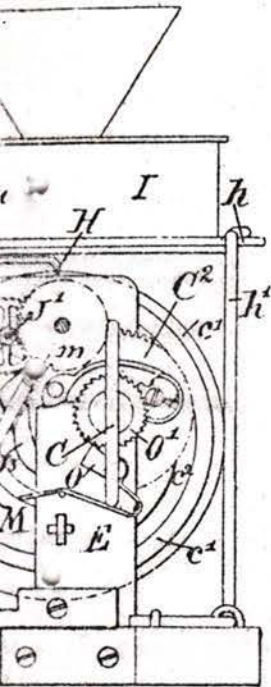


Fig. 18.

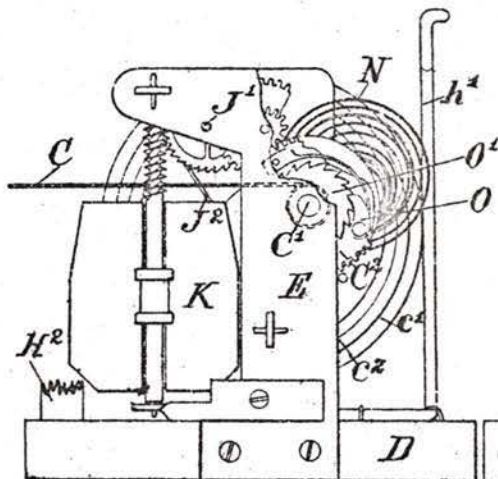


Fig. 19.

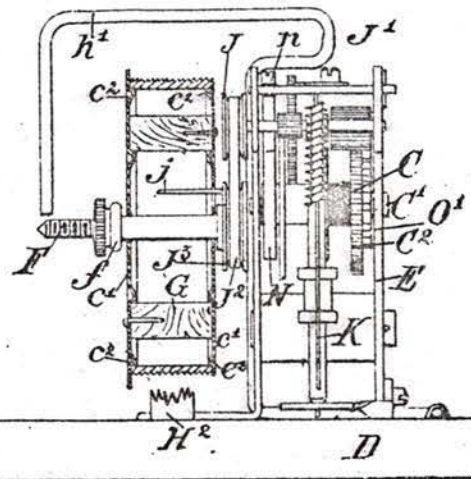
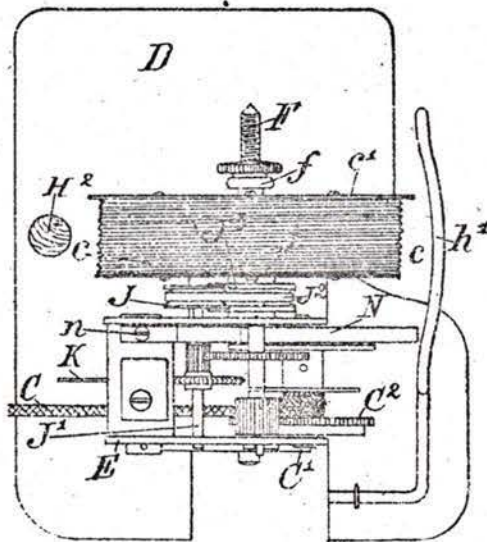


Fig. 20.







248 DEFENDANT'S EXHIBIT YOUNG BRITISH  
PATENT.

No. 1478

A. D. 1894

Date of Application, 23rd Jan., 1894  
Complete Specification Left, 27th Sept., 1894—Accepted,  
5th Oct., 1894

## Provisional Specification.

Improvements in connection with Phonographs, Gramma-  
phones, Graphophones, and similar Sound Recording and  
Reproducing Instruments.

I, Jonathan Lewis Young of 52 Fore Street, Moorgate  
Street, London E. C. Electrical Engineer do hereby declare  
the nature of this invention to be as follows:—

My present invention relates to a method of, and means for  
reproducing any number of duplicates or counterparts of  
sound records that have been engraved, indented or other-  
wise produced upon the rotund or cylindrical recording sur-  
faces of phonographs, grammaphones, graphophones and sim-  
ilar or other sound recording and reproducing instruments.

In the most approved or latest type of instrument of the  
kind referred to, a surface of prepared wax has been found  
the most suitable upon which to record sound vibrations, and  
hitherto no better means has been adopted or known for re-  
producing such sound vibrations than by employing the self  
same wax surface, upon which the record has been taken for  
operating the recording diaphragm, and it is a well  
known fact that whilst the said prepared wax is (so  
far as at present known) the most suitable material  
for such records, the same has but a short life  
when used for the purpose of reproduction, and that  
the resonant sharpness of each reproduction is perceptibly





less than those preceding it, this arising from the fact, that the very nature and qualification of the material rendering it so adaptable for the former purpose, is unsuited to stand against the constant friction of the reproducing stylus when used for the latter purpose, hence its short duration, and although the latest and most perfected machines of the kind referred to, are provided with a tool for shaving off the worn out record in order that the same wax cylinder may be again used for recording purposes, the production of such records are, in some cases, very costly, and this, naturally, materially adds to the costs of the maintenance of the machine, but according to my invention as hereinafter set forth, I am enabled to produce from the record first taken, any number of duplicates or counterparts upon material capable of withstanding for a lengthy period, the friction arising from contact with the reproducing stylus, and at a cost of about 90% less than that of the first record, hence the object of my invention.

I carry my invention into effect by first producing a record upon a wax cylinder by means of a recording stylus in the usual way, and this I carefully coat with plum-bago or other suitable material, capable of rendering the said wax surface of good electrical conductivity, and if the said wax cylinder be mounted upon a metallic base such parts of this as would be exposed I coat with some suitable insulating material, and then suspend the whole (or such part thereof as may be necessary) in an electrical plating bath, and electrically connect the said prepared surface of the record to the negative pole of a suitable primary, secondary or other battery, and I may use a plate or plates of copper, nickel, precious or other suitable metal as an anode, connected to the positive pole in the usual way, according to the nature of the bath and the deposit required, and by this means I coat the record with a metal-



lic surface, and when a sufficient deposit has been obtained, I remove the whole from the bath and expose the same to a gentle heat, until the whole of the wax has been melted and drained away, leaving behind a hollow metallic cylinder bearing upon its inner face an exact reproduction of the original record, but of course in reverse order, and when this has been thoroughly cleansed of such portions of wax as may be left behind, I fix the same rigidly within and upon a cylindrical or other shaped case, of metal or other material capable of maintaining the stability of the electro, and when the said electro and its case has been slightly heated or warmed, I place within the former a very thin hollow cylinder, of the same size externally as that of the original wax cylinder upon which the record was first taken. The said thin cylinder may be of any suitable material capable of being rendered plastic by the application of a gentle heat, such for instance as celluloid, xylonite, vulcanite or the like, and having a highly polished or perfectly smooth external surface, and when this has been rendered pliable by a gentle heat (which may be that given off from the heated electro and its casing) I press the same gently and evenly up to and against the face of the electro, and take an exact impression therefrom, and when the said plastic cylinder has cooled, I am enabled, by slightly collapsing this inwardly, to cleanly and easily remove it from the electro, when I am in possession of an exact duplicate of the original record, and all its delicate details, which I then mount upon the same or a like base as that from which the original record was removed, and the same may then be placed upon the machine and used for reproducing in the same manner as could and would have been the original wax record.

It must be borne in mind that, notwithstanding the duplicate thus produced, I am still in possession of the electro, which has not suffered in any way by the impression

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having been taken therefrom, and from which I am enabled to take in like manner, any number of further impressions, each of which would possess the same sharpness of detail as the first, and these when cold and mounted as stated, being considerably harder and more durable than wax, may be used for reproducing for an almost indefinite period, without any appreciable difference being observed in the clearness and distinctness of the reproduction.

Dated this 23rd day of January 1894.

GEO. THOS. HYDE,

4, Moorfields, Fore Street, London, E. C.,

Agent for the Applicant.

#### COMPLETE SPECIFICATION.

IMPROVEMENTS IN CONNECTION WITH PHONOGRAPHS, GRAMMAPHONES, GRAPHOPHONES, AND SIMILAR SOUND RECORDING AND REPRODUCING INSTRUMENTS.

I, JONATHAN LEWIS YOUNG, of 67 (late 52) Fore Street, Moorgate Street, London, E. C. Electrical Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My present invention relates to a method of and means for reproducing any number of duplicates or counterparts of sound records that have been engraved, indented or otherwise produced upon the rotund or cylindrical recording surfaces of phonographs, grammaphones, graphophones and similar or other sound recording and reproducing instruments.

In the most approved or latest type of instrument of the kind referred to, a surface of prepared wax has been found the most suitable upon which to record sound vi-



brations, and hitherto no better means has been adopted or known for reproducing such sound vibrations than by employing the self same wax surface, upon which the record has been taken, for operating the recording diaphragm and it is a well known fact that whilst the said prepared wax is (so far as at present known) the most suitable material upon which to produce such records, the same has but a short life when used for the purpose of reproduction, and that the resonant sharpness of each reproduction is perceptably less than those preceding it, this arising from the fact, that the very nature and qualification of the material rendering it so adaptable for the former purpose, is unsuited to stand against the constant friction of the reproducing stylus when used for the latter purpose hence its short duration, and although the latest and most perfected machines of the kind referred to, are provided with a tool for shaving off the worn out record in order that the same cylinder may be again used for recording purposes, the production of such records are, in some cases very expensive, and this naturally, materially adds to the costs of the maintenance of the machine, but according to my invention as hereinafter set forth, I am enabled to produce from the record first taken, any number of duplicates or counterparts thereof upon material capable of withstanding for a lengthy period, the friction arising from contact with the reproducing stylus, and at a cost of about 90% less than that of the first record, hence the objects of my invention.

I carry my invention into effect by first producing a record upon a wax cylinder by means of a recording stylus in the usual way, and this I carefully coat with plumbago or other suitable material, capable of rendering the said wax surface of good electrical conductivity, and if the said wax cylinder be mounted upon a metallic base, such parts of this as would be exposed, I coat with some suit-



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able insulating material, and then suspend the whole (or such part thereof as may be necessary) in an electrical plating bath, and electrically connect the said prepared surface of the record, to the negative pole of a suitable primary, secondary, or other battery, so that this may constitute the cathode, and I may use a plate or plates of copper, nickel, precious or other suitable metal as an anode, connected to the positive pole in the usual way, according to the nature of the bath, and the metallic deposit required, and by this means, I coat the record with a metallic surface, and when a sufficient deposit has been obtained, I remove the whole from the bath, and expose the same to a gentle heat, until the whole of the wax has been melted and drained away, leaving behind a hollow metallic cylinder, bearing upon its inner surface, an exact reproduction of the original record, but of course in reverse order, and when the said inner surface, has been thoroughly cleansed (by any of the well known methods,) of such portions of wax as may be left upon it, I fix the said cylinder rigidly within, and upon an outer cylindrical or other shaped case, of metal, or other material capable of maintaining the stability of the electro, and I may find it convenient to effect this, by casting the said outer case, around the cylindrical electro, which may be, before the wax has been dissolved therefrom, the heat from such casting (if metallic) being alone sufficient to effect the said melting of the wax, afterwards cleansed in the manner stated.

To produce a working record from the said electro, this and its case would be warmed or slightly heated by any convenient means, and within the said electro would then be placed a very thin hollow cylinder, of the same size externally as that of the original wax cylinder upon which the record was first taken. The said thin cylinder may be of any suitable material capable of being rendered



plastic by the application of a gentle heat, such for instance as celluloid, xylonite, vulcanite or the like, and having a highly polished or perfectly smooth external surface, and when this has been rendered pliable, by a gentle heat (which may be that given off from the heated electro and its casing) I press the same gently and evenly up to and against the face of the electro, and take an exact impression therefrom, and when the said plastic cylinder has cooled, I am enabled, by slightly collapsing this inwardly, to cleanly and easily remove it from the electro, when I am in possession of an exact duplicate of the original record and all its delicate details, which I then mount upon the same or a like base as that from which the original record was removed, and the same may then be placed upon the machine and used for reproducing in the same manner as could and would have been the original wax record.

It must be borne in mind that notwithstanding the duplicate thus produced, I am still in possession of the electro, which has not suffered in any way by the impression having been taken therefrom, and from which I am enabled to take in like manner, any number of further impressions, each of which would possess the same sharpness of detail as the first, and these when cold and mounted as stated, being considerably harder and more durable than wax, may be used for reproducing for an almost indefinite period, without any appreciable difference being observed in the clearness and distinctness of the reproduction.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that I am aware of the Specification of Liorets Patent No. 23366 of A. D. 1893, and I wish it to be understood that I do not claim any-

thing described and claimed therein, but what I do claim is:—

1st. In combination with a wax cylinder as used upon phonographs and the like and upon which sound vibrations have been recorded, the employment of the method and means of producing any number of duplicates or counterparts of such cylinders and the records thereon, substantially as and for the purposes herein described.

2d. In the production of duplicates or counterparts of the records of sound vibrations, the employment of the combination of a wax cylinder upon which sound vibrations have been recorded, an electrical plating bath for taking an electro from the said wax cylinder, a cylinder of celluloid, vulcanite, xylonite or any material of a like nature for taking an imprint of the said electro and the application of said cylindrical imprint to a phonograph or similar instrument for reproducing the said sound vibrations, substantially as herein described.

Dated this 27th day of September 1894.

GEO. THOS. HYDE,

1, Broad Street Buildings, Liverpool Street,

London, E. C.,

Agent for the Applicant.

Patent.

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12

PRAECIPE FOR RECORD.

Praeipie for  
record, filed Jan.  
12, 1905.

IN THE  
CIRCUIT COURT OF THE UNITED STATES,  
For the Northern District of Illinois—  
Northern Division.

National Phonograph Company, }  
  *vs.* 26598  
Lambert Company, }

To the Clerk of the above entitled Court:—

You will please prepare transcript of the record in this cause to be filed in the office of the clerk of the United States Circuit Court of Appeals for the Seventh Judicial Circuit, under the appeal heretofore perfected to said Court and include in the said transcript the following pleadings, proceedings and papers on file to-wit:

Printed Volume marked "Complainant's Record on Final Hearing".

Printed Volume marked "Defendant's Record".

Order entered of record July 1, 1904.,

Opinion filed August 17, 1904.

Decree of Dismissal entered August 17, 1904.

Petition for Appeal and Assignment of Errors filed January 4, 1905.

Order of January 4, 1905, Appeal allowed upon filing Bond.

Order of January 12, 1905, approving Bond, etc.

Bond filed January 12, 1905.

Stipulation filed January 5, 1905.

Said transcript to be prepared as required by law and the rules of this Court and the rules of the United States Circuit Court of Appeals for the Seventh Circuit and on file in the office of the clerk of the said Circuit Court of Appeals at Chicago, before February 6, 1905.

PHILIP C. DYRENFORTH,

RICHARD N. DYER,

*Solicitors for Appellant.*

(Endorsed) Filed January 12, 1905, Marshall E. Sampsell, Clerk.



Certificate of clerk. 13 Northern District of Illinois, } ss.  
Northern Division,

I, Marshall E. Sampsell, Clerk of the Circuit Court of the United States for said Northern District of Illinois, do hereby certify the above and foregoing contained in two printed volumes marked "Complainants Record on final Hearing" and "Defendant's Record" and 13 type-written pages to be a true and complete transcript of the proceedings had of record in said Court and made in accordance with Stipulation and Praeipie filed in the cause entitled National Phonograph Company, Complainant vs. Lambert Company, Defendant, General Number 26,598, as the same appear from the original records and files of said Court now remaining in my custody and control.

In Testimony Whereof, I have hereunto set my hand and affixed the seal of said Court at my office in the City of Chicago, in said District, this 19th day of January, 1905.

(Seal)

MARSHALL E. SAMPSELL,  
Clerk.

United States }  
of America, } ss.

Citation; filed Jan.  
5, 1905.

*The President of the United States, To the Lambert Company:*

You Are Hereby Cited and Admonished to appear in the United States Circuit Court of Appeals for the Seventh Judicial Circuit, in the United States Court house in the City of Chicago, State of Illinois, on the 1st day of February, 1905, pursuant to an appeal duly taken by National Phonograph Company, from a certain final decree made by the United States Circuit Court for the Northern District of Illinois, Northern Division, dismissing the bill of complaint in a certain suit in Equity, wherein the said National Phonograph Company is the complainant, and you, the said Lambert Company, is the defendant, and you are also admonished upon your appearance to show cause, if any there be, why the said decree entered against said National Phonograph Company should not be corrected and why speedy justice should not be done to the parties in that behalf.

Witness, the Honorable Melville W. Fuller, Chief Justice of the Supreme Court of the United States, this 4th day of January, in the year of our Lord one thousand nine hundred and five, and of the Independence of the United States, the one hundredth and twenty-ninth.

KOHLSAAT,  
U. S. J.

Dated January 4, 1905.

Due service of the foregoing citation upon the Lambert Company is hereby acknowledged, this 5th day of January, 1905.

THOMAS F. SHERIDAN,  
*Solicitor for Lambert Company.*

(Endorsed) 26598. United States Circuit Court Northern District of Illinois, Northern Division. National Phonograph Company, Complainant, vs. Lambert Company, Defendant. Circuit Court of the United States, Northern District of Illinois, Northern Division, Filed Jan 5 1905 Marshall E. Sampsell, Clerk.

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LL E. SAMPSELL,  
Clerk.